ARMY TM 11-5820-401-12
NAVY NAVELEX 0967-432-3010

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

RADIO SETS AN/VRC-12 (5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), AN/VRC-49 (5820-00-223-7437), AN/VRC-54 (5820-00-223-7567), AND AN/VRC-55 (5820-00-402-2265); MOUNTING MT-1029/VRC (5820-00-893-1323) AND MOUNTING MT-1898/VRC (5820-00-893-1324); ANTENNA AT-912/VRC (5820-00-897-6357); CONTROL, FREQUENCY SELECTOR C-2742/VRC (5820-00-892-3343) AND CONTROL, RADIO SET C-2299/VRC (5820-00-892-3340)

This copy is a reprint which includes current pages from Changes 1 through 3.

DEPARTMENTS OF THE ARMY AND THE NAVY
SEPTEMBER 1972

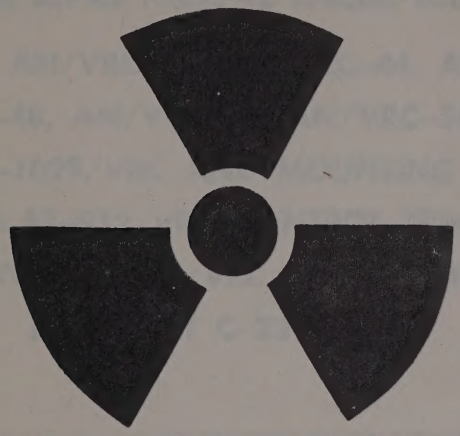
WARNING

Dangerous voltages exist at the antennas of the receiver-transmitters.

Do not touch these antennas while the receiver-transmitters are transmitting.

Observe the precautions given in TB SIG 291 concerning vehicular whip antennas.

WARNING
RADIATION HAZARD



RADIOACTIVE MATERIAL
CONTROLLED DISPOSAL REQUIRED
ACCOUNTABILITY NOT REQUIRED

STD RW—2

Ammeter	Ra 226	0.59uCi	6625-00-569-0243
Audio level meter	Ra 226	0.69uCi	6625-00-669-0769
	Electron Tube OA2WA		5960-00-503-4880
EEVC	U 238	0.1uCi	
CBS Hytron	Ni 63	0.5uCi	
Rattheon	Co 60	0.2uCi	
	Electron Tube 5670		5960-00-188-6584
RCA	Th 232	0.07uCi	

Radiation Hazard Information: The following radiation hazard information must be read and understood by all personnel before operating or repairing the AN/VRC-12, -43, -44, -45, -46, -47, -49, -54, and -55. Hazardous radioactive materials are present in the above listed components of the T-195A, B/GRC and the AN/VRC-24A. The components are potentially hazardous when broken. See qualified medical personnel and the local Radiological Protection Officer (RPO) immediately, if you are exposed to or cut by broken components. First aid instructions are contained in TB 43-0116, TB 43-0122, and AR 755-15.

NEVER place radioactive components in your pocket.

Use extreme care NOT to break radioactive components while handling them.

NEVER remove radioactive components from cartons until you are ready to use them.

If any of these components are broken, notify the local RPO immediately. The RPO will survey the immediate area for radiological contamination and will supervise the removal of broken components.

The above listed radioactive components *will not* be repaired or disassembled. Disposal of broken, unserviceable, or unwanted radioactive components will be accomplished in accordance with the instructions in AR 755-15.

TECHNICAL MANUAL
No. 11-5820-401-12
TECHNICAL MANUAL
NAVELEX 0967-432-3010

DEPARTMENTS OF THE ARMY
AND THE NAVY
WASHINGTON, DC, *7 September 1972*

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL INCLUDING REPAIR PARTS AD SPECIAL TOOLS LISTS

RADIO SETS AN/VRC-12, AN/VRC-53, AN/VRC-44, AN/VRC-45, AN/VRC-46, AN/VRC-47, AN/VRC-48, AN/VRC-49, AN/VRC-54, AND AN/VRC-55 MOUNTING MT-1029/VRC AND MOUNTING MT-1898/VRC ANTENNA AT-912/VRC; CONTROL, FREQUENCY SELECTOR C-2742/VRC AND CONTROL, RADIO SET C-2299/VRC

			Paragraph	Page
CHAPTER 1.		INTRODUCTION		
SECTION I.		General	1-1—1-5	1-1
	II.	Description and data	1-6—1-14	1-2
CHAPTER 2.		INSTALLATION OF RADIO SETS		
SECTION I.		General	2-1—2-4	2-1
	II.	Installing, assembling, disassembling, and handling radio equipment	2-5—2-13	2-2
CHAPTER 3.		OPERATING INSTRUCTIONS		
SECTION I.		Controls, indicators, and receptacles	3-1—3-13	3-1
	II.	Operation of radio sets and radio-intercom system equipment	3-14—3-21	3-15
	III.	Operation under unusual conditions	3-22—3-24	3-30
CHAPTER 4.		OPERATOR MAINTENANCE INSTRUCTIONS		
SECTION I.		Preventive maintenance	4-1—4-3	4-1
	II.	Operator troubleshooting procedures	4-4—4-6	4-5
CHAPTER 5.		ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
SECTION I.		Preventive maintenance	5-1—5-5	5-1
	II.	Troubleshooting	5-6—5-11	5-7
	III.	Repair procedures	5-12—5-14	5-22
CHAPTER 6.		MATERIEL USED IN CONJUNCTION WITH AN/VRC-12 SERIES RADIOS		
SECTION I.		Radio-intercom system, audio accessories, cable assemblies, power supply, antenna, and retransmission equipment	6-1—6-7	6-1
	II.	Remote control and radio/wire integration (RWI) equipment used with AN/VRC-12 series radios	6-8—6-10	6-6
	III.	Radio Set AN/VRC-54	6-11—6-15	6-18
	IV.	Radio Set AN/VRC-55	6-16—6-20	6-25
APPENDIX A.		REFERENCES		A-1
	B.	MAINTENANCE ALLOCATION		B-1
SECTION I.		Introduction		B-1
	II.	Maintenance allocation chart for Radio Set AN/VRC-12		B-3
	III.	Maintenance allocation chart for Radio Set AN/VRC-43		B-4
	IV.	Maintenance allocation chart for Radio Set AN/VRC-44		B-5
	V.	Maintenance allocation chart for Radio Set AN/VRC-45		B-6
	VI.	Maintenance allocation chart for Radio Set AN/VRC-46		B-7
	VII.	Maintenance allocation chart for Radio Set AN/VRC-47		B-8

* This manual supersedes TM 11-5820-401-10, 20 December 1961, including all changes and TM 11-5820-401-20, 20 December 1961, including all changes.

		Page
SECTION VIII.	Maintenance allocation chart for Radio Set AN/VRC-48	B-9
IX.	Maintenance allocation chart for Radio Set AN/VRC-49	B-10
X.	Maintenance allocation chart for Radio Set AN/VRC-54	B-11
XI.	Maintenance allocation chart for Radio Set AN/VRC-55	B-12
XII.	Maintenance allocation chart for Receiver-Transmitters, Radio RT-246/VRC, RT-246/VRC, RT-524/VRC, and RT-524A/VRC; Receivers, Radio R-442/VRC and R-442A/VRC; and Antenna AS-1729/VRC	B-13
APPENDIX C.	ORGANIZATIONAL REPAIR PARTS LISTS	C-1
INDEX		Index-1

LIST OF ILLUSTRATIONS

Number	Title	Page
1-1	Radio Set AN/VRC-47, Installed in Vehicle	1-0
1-2	Typical Radio Sets Compatible with AN/VRC-12 Series Radios	1-6
1-3	Radio Sets AN/VRC-12 and AN/VRC-47, System Application	1-7
1-4	Radio Sets AN/VRC-46 and AN/VRC-43, System Application	1-8
1-5	Radio Sets AN/VRC-44 and AN/VRC-48, System Application	1-8
1-6	Radio Sets AN/VRC-49 and AN/VRC-45, System Application	1-9
1-7	AN/VRC-12 Series Radios	1-13
1-8	Receivers-Transmitters, Radio RT-246/VRC and RT-246A/VRC, Front Views	1-17
1-9	Receiver-Transmitters, Radio RT-524/VRC and RT-524A/VRC, Front Views	1-18
1-10	Receiver, Radio R-442(*)/VRC, Front View	1-19
1-11	Antenna AS-1729/VRC, Disassembled	1-20
1-12	Antenna AT-912/VRC, Disassembled	1-21
1-13	Mountings MT-1029/VRC and MT-1898/VRC	1-22
1-14	Receiver-Transmitter, Radio RT-246/VRC Installed on Mounting MT-1029/VRC	1-22
1-15	Receiver-Transmitter, Radio RT-524A/VRC Installed on Mounting MT-1029/VRC	1-23
1-16	Receiver, Radio R-442(*)/VRC, Installed on Mounting MT-1898/VRC	1-24
1-17	Control, Radio Set C-2299/VRC	1-25
1-18	Control, Frequency Selector C-2742/VRC	1-25
2-1	Antennas AS-1729/VRC and AT-912/VRC, Matching Unit Details	2-6
2-2	Tying Safety Wire Between AS-1730/VRC and MX-6707/VRC of AS-1729/VRC	2-7
2-3	Details of MX-6707/VRC Installed in Bracket on Vehicle	2-8
2-4	Mast Base AB-15/GR and Antenna Elements MS-116A, MS-117A, and MS-118A (Antenna Tip Cap for MS-118A Is Not Shown)	2-10
2-5	Mast Base AB-15/GR, Assembly View; and Adaptor UG-306/U	2-11
2-6	Mast Base AB-558/GR, Detail View; and Adapter UG-306/U	2-12
2-7	Mounting MT-1029/VRC, Parts Identification	2-13
2-8	Mounting MT-1898/VRC, Parts Identification	2-14
2-9	Mounting MT-1029/VRC, Disassembled and with Typical Cables Attached to Receptacles	2-15
2-10	Mounting MT-1898/VRC, Disassembled and with Typical Cables Attached to Receptacles	2-16
2-11	Junction Box of MT-1029/VRC, Posioning of Power Control Link	2-17
2-12	Junction Box of MT-1898/VRC, Positioning of Power Control Link	2-18
2-13	Cable Assemblies, Power Electrical CX-4721/VRC and CX-4720/VRC	2-19
2-14	Bendix Connector and CX-4720/VRC, Assembly Instructions	2-21
2-15	Connecting CX-4720/VRC to Vehicle Battery	2-21
2-16	Intercommunication Set AN/VIC-1(V), Components	2-23
2-17	Typical Cable Assemblies Used with AN/VRC-12 Series Radios and Radio-Intercom System Installation	2-24
2-18	AM-1780/VRC, Cabling Details	2-25
2-19	Details of Cable Connectors	2-26
2-20	Typical Cabling Diagram for AN/VRC-12	2-28

Number	Title	Page
2-21	Typical Cabling Diagram for AN/VRC-43	2-29
2-22	Typical Cabling Diagram for AN/VRC-44	2-30
2-23	Typical Cabling Diagram for AN/VRC-45	2-31
2-24	Typical Cabling Diagram for AN/VRC-46	2-32
2-25	Typical Cabling Diagram for AN/VRC-47	2-33

Number	Title	Page
2-26	Typical Cabling Diagram for AN/VRC-48	2-34
2-27	Typical Cabling Diagram for AN/VRC-49	2-35
2-28	Typical Cabling Diagram for AN/VRC-12 with Radio-Intercom System	2-36
2-29	Typical Cabling Diagram for AN/VRC-43 with Radio-Intercom System	2-37
2-30	Typical Cabling Diagram for AN/VRC-44 with Radio-Intercom System	2-38
2-31	Typical Cabling Diagram for AN/VRC-45 with Radio-Intercom System	2-39
2-32	Typical Cabling Diagram for AN/VRC-46 with Radio-Intercom System	2-40
2-33	Typical Cabling Diagram for AN/VRC-47 with Radio-Intercom System	2-41
2-34	Typical Cabling Diagram for AN/VRC-48 with Radio-Intercom System	2-42
2-35	Typical Cabling Diagram for AN/VRC-49 with Radio-Intercom System	2-43
3-1	RT-246(*)/VRC, Controls, Indicators, and Receptacles	3-2
3-2	RT-246(*)/VRC, Pushbutton Tuning Controls	3-3
3-3	RT-524(*)/VRC, Controls, Indicators, and Receptacles	3-5
3-4	R-442(*)/VRC, Controls, Indicators, and Receptacles	3-6
3-5	AM-1780/VRC, Controls, Indicator, and Receptacles	3-10
3-6	C-2296/VRC, Controls, Receptacles, and Handset H-207/VRC	3-11
3-7	C-2297/VRC, Controls, Indicator, and Receptacles	3-13
3-8	C-2298/VRC, Controls and Receptacles	3-13
3-9	C-2299/VRC, Controls and Receptacles	3-14
3-10	C-2742/VRC, Controls, Indicator, and Receptacles	3-14
3-11	Typical Handsets Used with Radios	3-16
3-12	Typical Microphone and Headset Used with Radios and Headset-Microphone Used with Radio-Intercom Equipment	3-17
3-13	Loudspeaker LS-454/U and Extension Cable CX-7867/VRC Used with LS-454/U	3-18
3-14	CVC Helmet with Typical Audio Accessory Installed	3-19
3-15	C-2298/VRC, Cable and Audio Accessory Connections	3-20
3-16	Typical Connections of Audio Accessories to Receiver-Transmitter	3-21
3-17	Typical Connections of Audio Accessories to Control Boxes of Radio-Intercom Equipment	3-21
5-1	Heat Exchanger and Power Transistor Assembly of Receiver-Transmitter	5-6
5-2	TS-2609/U Connected to Receiver-Transmitter	5-8
5-3	RT-246(*)/VRC, Top View with Assemblies in Place	5-23
5-4	RT-246(*)/VRC, Top View with Assemblies A3000 and A8000 Raised	5-24
5-5	RT-246(*)/VRC, Bottom View with Assemblies in Place	5-25
5-6	RT-246(*)/VRC, Bottom View with Assembly A4000 Raised	5-26
5-7	RT-524(*)/VRC, Top View with Assemblies in Place	5-27
5-8	RT-524(*)/VRC, Top View with Assemblies A3000 and A8000 Raised	5-28
5-9	RT-524(*)/VRC, Bottom View with Assemblies in Place	5-29
5-10	RT-524(*)/VRC, Bottom View with Assembly A4000 Raised	5-30
5-11	Assembly A3000, Parts Removal and Replacement Procedures	5-32
5-12	Assembly A4000, Parts Removal and Replacement Procedures	5-34
5-13	Assembly A8000, Parts Removal and Replacement Procedures	5-36
5-14	Assembly A5000 Removed from Radio; and Assembly A2100 in Place in Radio	5-38
5-15	Assembly A9000, Removal and Replacement Procedures	5-40
5-16	Location of Relays K401, K402, K403, K404, and K406 after Assembly A9000 is Removed	5-42
5-17	R-442(*)/VRC, Top View with Assembly A3000 in Place	5-43
5-18	R-442(*)/VRC, Top View with Assembly A3000 Raised	5-44
5-19	R-442(*)/VRC, Bottom View with Assembly A4000 in Place	5-45
5-20	R-442(*)/VRC, Bottom View with Assembly A4000 Raised	5-45
6-1	Retransmission Cable Kit MK-456A/GRC, Components	6-4

Number	Title	Page
6-2	Connections and Conditions for Retransmission Operation Using Retransmission Cable Kit MK-456A/GRC Between Receiver-Transmitters	6-5
6-3	Use of AN/GRA-39(*) for Remote Control and Radio-Wire Integration with AN/VRC-12 Series Radios	6-7
6-4	Oscillator O-574/GRA with Batteries BA-1312/U	6-8
6-5	Schematic Diagrams of Oscillator, Audio Frequency O-574/GRA; and Cables CX-7474/U and CX-10177/U	6-10
6-6	Installation of Batteries in O-574/GRA	6-11
6-7	Cable Assembly, Special Purpose Electrical CX-7474/U	6-12
6-8	Using AN/GSA-7 and O-574(GRA to Provide Radio/Wire Integration with Receiver-Transmitter	6-13
6-9	Connections and Control Settings of AN/GSA-7 and SB-22/PT to Provide Radio/Wire Integration for Receiver-Transmitter	6-14
6-10	Connections for Remote Control Operation and RWI Operation of Receiver-Transmitters Using AN/GRA-6	6-17
6-11	Radio Set AN/VRC-54, System Application	6-18
6-12	Details for Installing Cable and Parts in MT-1436/U of AN/VRC-24(*) in AN/VRC-54 Installations	6-20
6-13	Typical Cabling Details of AN/VRC-24(*) and AN/VRC-46 in AN/VRC-54 Installations	6-21
6-14	AN/PRC-25 Installed on User's Back (10-Foot Whip Antenna and Equipment Bag not Shown)	6-23
6-15	Radio Set AN/VRC-55, System Application	6-26
6-16	Details of Junction Box J-1014/VRC Modified by Use of Cable Assembly CX-4723/VRC	6-28
6-17	Typical Cabling of AN/VRC-19 and AN/VRC-46 in AN/VRC-54 Installations	6-29
C-1	Receiver-Transmitter, Radio RT-246A/VRC, Front View	C-20
C-2	Receiver-Transmitter, Radio RT-524A/VRC, Front View	C-21
C-3	Receiver, Radio R-442(*)/VRC, Front View	C-22
C-4	Receiver-Transmitter, Top View; Assemblies A3000 and A8000 Lowered; Repair Parts Location	C-23
C-5	Receiver-Transmitter, Bottom View; Assembly A4000 Lowered; Repair Parts Location	C-24
C-6	Receiver, Radio R-442(*)/VRC, Top View; Assembly A3000 Lowered; Repair Parts Location	C-25
C-7	Receiver, Radio R-442(*)/VRC, Bottom View; Assembly A4000 Lowered; Repair Parts Location	C-26
C-8	Crystal Reference System Assembly A3000 (part of Receiver-Transmitters and R-442(*)/VRC; Repair Parts Location	C-27
C-9	Amplifier Assembly, Intermediate Frequency Assembly A4000 (Part of Receiver-Transmitters and R-442(*)/VRC); Repair Parts Location	C-28
C-10	Amplifier, Modulator Assembly A8000 (Part of Receiver-Transmitters); Repair Parts Location	C-29
C-11	Amplifier Assembly, Intermediate Frequency Assembly A5000 (Part of Receiver-Transmitters and R-442(*)/VRC); Repair Parts Location	C-30
C-12	Switch, Null Assembly A7000 (Part of RT-246(*)/VRC); Repair Parts Location	C-31
C-13	RT-246A/VRC, Front Control Panel Assembly; Repair Parts Location	C-32
C-14	RT-524A/VRC, Front Control Panel Assembly; Repair Parts Location	C-33
C-15	F-442(*)/VRC, Front Control Panel Assembly; Repair Parts Location	C-34
C-16	Voltage Regulator Assembly A2100, Circuit Card Assembly A2101; (Part of Receiver-Transmitters and R-442(*)/VRC); Repair Parts Location	C-35

Number	*Title*	*Page*
FO–1①	Interfering Frequencies Chart (Part 1 of 2)	Fold-in
FO–1②	Interfering Frequencies Chart (Part 2 of 2)	Fold-in
FO–2	Dc Power Distribution Circuits of MT–1029/VRC, CX–4720/VRC, and MX–7778/GRC	Fold-in
FO–3	Dc Power Distribution Circuits of Radio System and Radio-Intercom System	Fold-in
FO–4	Radio Transmission Circuits of Audio Signals (Microphone) and Keying Control in Radio System and Radio-Intercom System	Fold-in
FO–5	Radio Reception Circuits of Audio Signals in Radio System and Radio-Intercom System	Fold-in
FO–6	Intercom Transmission and Reception Circuits of Audio Signals and Keying Control in Radio-Intercom System	Fold-in
FO–7	AN/VRC–49 and AN/VRC–45 Retransmission Circuits of Audio Signals and Keying Control Using C–2299/VRC Between Receiver-Transmitters	Fold-in
FO–8	Retransmission Circuits of Audio Signals and Keying Control Using CX–4656/GRC of MK–456/GRC Between Receiver-Transmitters and RT–505/PRC–25 or RT–841/PRC–77	Fold-in
FO–9	AN/VRC–54 Retransmission Circuits of Audio Signals and Keying Control Using C–2299/VRC between RT–524(*)/VRC and RT–323(*)/VRC–24	Fold-in

Figure 1-1. Radio Set AN/VRC-47, installed in vehicle.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. General. This manual provides operation and maintenance instructions, component listings, and organizational maintenance repair parts listing for the following equipment:

(1) Radio Sets AN/VRC-12, AN/VRC-43, AN/VRC-44, AN/VRC-45, AN/VRC-46, AN/VRC-47, AN/VRC-48, and AN/VRC-49.

(2) Radio Sets AN/VRC-54 and AN/VRC-55 which include Radio Set AN/VRC-46 are covered in chapter 6.

(3) Receiver-Transmitters, Radio RT-246/VRC and RT-246A/VRC. These units are part of Radio Sets AN/VRC-12, AN/VRC-43, AN/VRC-44, and AN/VRC-45.

(4) Receiver-Transmitters, Radio RT-524/VRC and RT-524A/VRC. These units are part of Radio Sets AN/VRC-46, AN/VRC-47, AN/VRC-48, and AN/VRC-49.

(5) Receivers, Radio R-442/VRC and R-442A/VRC. These units are part of Radio Sets AN/VRC-12, AN/VRC-44, AN/VRC-47, and AN/VRC-48.

(6) Mounting MT-1029/VRC which is used with the receiver-transmitters, and Mounting MT-1898/VRC which is used with the receivers.

(7) Antenna AT-912/VRC which may be used with the radio sets.

(8) Control, Frequency Selector C-2742/VRC which is used for remote control of the RT-246/VRC and RT-246A/VRC.

(9) Control, Radio Set C-2299/VRC which is used with radio relay configurations AN/VRC-45, AN/VRC-49, AN/VRC-54, and AN/VRC-55 for radio retransmission operation.

b. Official Nomenclature. Official nomenclature followed by (*) indicates all models of the equipment; thus,

(1) Receiver-Transmitters, Radio RT-246(*)/VRC represents RT-246/VRC and RT-246-A/VRC.

(2) Receiver-Transmitter, Radio RT-524(*)/VRC represents RT-524/VRC and RT-524-A/VRC.

(3) Receiver, Radio R-442(*)/VRC represents R-442/VRC and R-442A/VRC.

(4) Radio Set AN/VRC-24(*) represents AN/VRC-24 and AN/VRC-24A.

(5) Power Supply PP-2953(*)/U represents PP-2953/U, PP-2953A/U, and PP-2953B/U.

c. Common names. Throughout this manual, the following common names are used to represent the indicated equipment:

Item	*Common name*
AN/VRC-12 and AN/VRC-43 through AN/VRC-49.	AN/VRC-12 series radios, or radio set.
Receiver-Transmitters, Radio RT-246(*)/VRC and RT-524(*)/VRC.	Receiver-transmitters.
Intercommunication Set AN/VIC-1(V).	Radio-intercom system.
Microphone, Dynamic M-80/U; Headsets H-140A/U, H-251/U; Headset-Microphone H-161/U; Loudspeaker LS-454/U; and CVC helmet.	Audio accessories is a term used in this manual to apply to these and similar devices.
Combat Vehicle Crewman Helmet T56-6 with Headset-Microphone Kit MK-1039/U as the audio accessory installed in it.	CVC helmet.
Mounting MT-1029/VRC and Mounting MT-1898/VRC.	Radio mounts.
Antenna Matching Unit-Base MX-6707/VRC (part of Antenna AS-1729/VRC; fig. 1-11); or Antenna Matching Unit MX-2799/VRC with Base, Antenna Support AB-719/VRC installed (part of Antenna AT-912/VRC; fig. 1-12).	Antenna matching unit or matching unit.

Item	*Common name*
Intercommunication Set AN/VIC-1(V) with associated interconnecting cables (fig. 2-16).	Radio-intercom system.
Controls, Intercommunication C-2296/VRC, C-2297/VRC, and C-2298/VRC.	Control boxes.

1-2. Maintenance Forms and Records; Administrative Storage

a. Department of the Army forms and procedures used for equipment maintenance shall be those prescribed in TM 38-750.

b. For procedures, forms and records, and inspection required during administrative storage of this equipment, refer to TM 740-90-1.

1-3. Destruction of Army Materiel to Prevent Enemy Use

For information on this subject, refer to TM 750-244-2.

1-4. Equipment Serviceability Criteria

Following are publications covering criteria for determining serviceability of the radio sets covered in this manual.

Equipment	*Publication*
AN/VRC-12	TM 11-5820-401-ESC/1
AN/VRC-43	TM 11-5820-401-ESC/3
AN/VRC-46	TM 11-5820-401-ESC/2
AN/VRC-47	TM 11-5820-401-ESC/4
AN/VRC-49	TM 11-5820-401-ESC/5
AN/VRC-54	TM 11-5820-401-ESC/7

1-5. Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Report should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commanding General, US Army Electronics Command, ATTN: AMSEL-MA-CR, Fort Monmouth, NJ 07703.

Section II. DESCRIPTION AND DATA

1-6. Purpose and Use

The AN/VRC-12 series radios (fig. 1-7) provide short range, two-way, radiotelephone communication in 30.00 to 75.95 MHz range, using frequency-modulated (fm) transmission and reception. The radio sets are used in such vehicles as Jeeps, trucks, tanks, and armored personnel carriers. They are also used in light planes and helicopters, in some communication shelters and vans as an auxiliary radio for communication in fm band, and in small marinecraft.

a. The radio sets as such are not operational; they also require power cable connections to the electrical power system of the vehicle, a radio mount (fig. 1-13), antenna cables, and antenna control cables, R-442(*)/VRC antennas, audio accessories for talking and listening, and a 22- to 30-volt dc power source (para 1-11).

b. The AN/VRC-12 series radios can be used alone or in conjunction with vehicular radio-intercom equipment (fig. 2-28 through 2-35) such as Intercommunication Set AN/VIC-1(V) (fig. 2-16). The radio-intercom equipment is provided in combat vehicles which require a crew to perform their mission. Such combat vehicles include tanks, armored personnel carriers, and armored command posts.

(1) In such vehicles as armored personnel carriers and armored command posts, the AN/VIC-1(V) consists of Audio Frequency Amplifier AM-1780/VRC and Control, Intercommunication Set C-2298/VRC for each crewmember.

(2) In such combat vehicles as tanks, the AN/VIC-1(V) also includes Control, Intercommunication Set C-2297/VRC for the driver, and Control, Intercommunication Set C-2296/VRC mounted on the outside of the vehicle.

(3) The control boxes provide facilities for the crewmembers, using audio accessories installed in their CVC helmets, to communicate on the radio set and to communicate on the intercom between crewmembers.

c. The AN/VRC-12 series radios can also be used in conjunction with other equipment ((1) through (6) below).

(1) Power Supply PP-2953(*)/U can be used in fixed installation to provide operating dc power (para 6-5).

(2) Antenna Equipment RC-292 can be used in place of the vehicular whip antenna to extend the communication distance (para 6-6).

(3) The AN/VRC-12 series radios can be connected to other radio sets for radio relay use by means of the cable in Retransmission Cable

Kit MK-456A/GRC (para 6-7). Such radios can be man-pack Radio Sets AN/PRC-25 and AN/PRC-77 and the vehicular versions of these radio sets: Radio Sets AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160.

(4) Remote control of the AN/VRC-12 series radios can be provided by Radio Set Control Group AN/GRA-39(*) (para 6-8*a*) and Radio Set Control AN/GSA-6 (para 6-10*a*).

(5) Radio/wire integration (RWI) operation with the AN/VRC-12 series radios and remote telephone facilities can be provided by Radio Set Control AN/GSA-7 with Oscillator O-574/GRA (para 6-9*b*). The AN/GRA-39(*) (para 6-8*b*) and AN/GSA-6 (para 6-10*b*) can also be used for radio/wire integration operation.

(6) The AN/VRC-12 series radios can be used with secure voice equipment and digital data equipment using X-mode facility of the radio sets.

(7) An improved Cable Assembly, Special Purpose, Electrical CX-4722A/VRC is available. It is provided with a right-angle connector for connection to the receiver-transmitter ANT CONT receptacle, thus reducing possibility of damage to the connector. All references in this manual to the CX-4722/VRC apply to the CX-4722A/VRC.

1-7. System Application

(fig. 1-2)

a. Compatible Fm Radio Sets. Figure 1-2 and the following chart shows various radio sets with which the AN/VRC-12 series radios can communicate within 30.00- to 75.95-MHz band. The chart below lists the frequency ranges and the channel spacing of the radio sets and their associated publications. All radios listed, except those in which preset crystals are required, can tune to any frequency within its operating range. Take note of the channel spacing in kiloHertz (kHz). *For example,* communication with the AN/PRC-6 can occur on 50.00, 50.20, and 50.40 MHz, etc.

Radio set	Frequency range (MHz)	Channel spacing: every	Publication	Remarks
AN/VRC-12, AN/VRC-43 through AN/VRC-49 [a].	30–75.95	50 kHz	TM 11-5820-401-12	
AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 [a].	30–75.95	50 kHz	TM 11-5820-498-12	
AN/VRC-54, AN/VRC-55 [b]	30–75.95	50 kHz	TM 11-5820-401-12	Paragraphs 6–11 and 6–16.
AN/PRC-25 [a]	30–75.95	50 kHz	TM 11-5820-398-12	
AN/PRC-77 [a]	30–75.95	50 kHz	TM 11-5820-667-12	
AN/PRC-6	47–55.4	200 kHz	TM 11-296	Uses preset crystals.
AN/PRC-9	30–38.90	100 kHz	TM 11-5820-292-10	
AN/PRC-10	38–54.90	100 kHz	TM 11-5820-292-10	
AN/PRC-28	30–42.00	100 kHz	TM 11-5820-292-10	
AN/ARC-44	24–51.90	100 kHz	TM 11-5821-204-12	When modified by reducing transmitter deviation.
AN/ARC-54 [a]	30–69.95	50 kHz	TM 11-5821-244-12	
AN/ARC-114 [a]	30–75.95	50 kHz	TM 11-5821-259-20	
AN/ARC-131 [a]	30–75.95	50 kHz	TM 11-5820-670-12	Used also for radio relay.
AN/ASC-10(V) [a]	30–69.95 or 30–75.95	50 kHz	TM 11-5821-276-15	Includes either AN/ARC-54 or AN/ARC-131.
AN/ASC-11 [b]	30–75.95	50 kHz	TM 11-5821-279-12	Used also for radio relay.
AN/ASC-15 [a]	30–75.95	50 kHz	TM 11-5821-285-12	Includes AN/ARC-131.
AN/GRC-10, AN/GRC-39, and AN/GRC-40	50–70.9	100 kHz	TM 11-614	
AN/GRC-163 [a]	30–75.95	50 kHz	TM 11-5820-713-15	Includes AN/VRC-47.
AN/FSQ-75 [b]	30–75.95	50 kHz	TM 11-5895-590-10	
AN/TSQ-70A [b]	30–75.95	50 kHz	TM 11-5895-579-12	
AN/TSQ-71A [b]	30–75.95	50 kHz	TM 11-5895-474-12	
AN/PRR-9 [a]	47–57.00	100 kHz	TM 11-5820-549-12	Squad radio; can only receive.
AN/PRT-4, AN/PRT-4A [a]	47–57.00	100 kHz	TM 11-5820-549-12	Squad radio; can only transmit. AN/PRT-4 does transmit 150-Hz squelch tone.
RT-67/GRC in:	27–38.90	100 kHz		
AN/GRC-5, AN/GRC-6	-------	-------	TM 11-284	
AN/VRQ-2	-------	-------	TM 11-287	
AN/VRC-9	-------	-------	TM 11-286	
AN/VRC-14	-------	-------	TM 11-291	
AN/VRC-17	-------	-------	TM 11-611	
AN/VRC-21	-------	-------	TM 11-642	
RT-68/GRC in:	38–54.90	100 kHz		
AN/GRC-7, AN/GRC-8	-------	-------	TM 11-284	
AN/VRQ-3	-------	-------	TM 11-287	
AN/VRC-10	-------	-------	TM 11-286	
AN/VRC-15	-------	-------	TM 11-291	
AN/VRC-18	-------	-------	TM 11-611	
AN/VRC-22	-------	-------	TM 11-642	

RT-70/GRC in:	47-58.40	100 kHz	TM 11-290
AN/GRC-5 through AN/GRC-8 ----------	-------	-------	TM 11-284
AN/VRC-7 ----------	-------	-------	TM 11-285

[a] These radios have the squelch feature in them that make them compatible with AN/VRC-12 series radios for new squelch operation (150-Hz squelch tone).
[b] In these radio configurations, AN/VRC-46 or AN/VRC-49 is a component.

AN/TSC-61A[b]	30-75.95	50 kHz	TM 11-5895-469-15-1

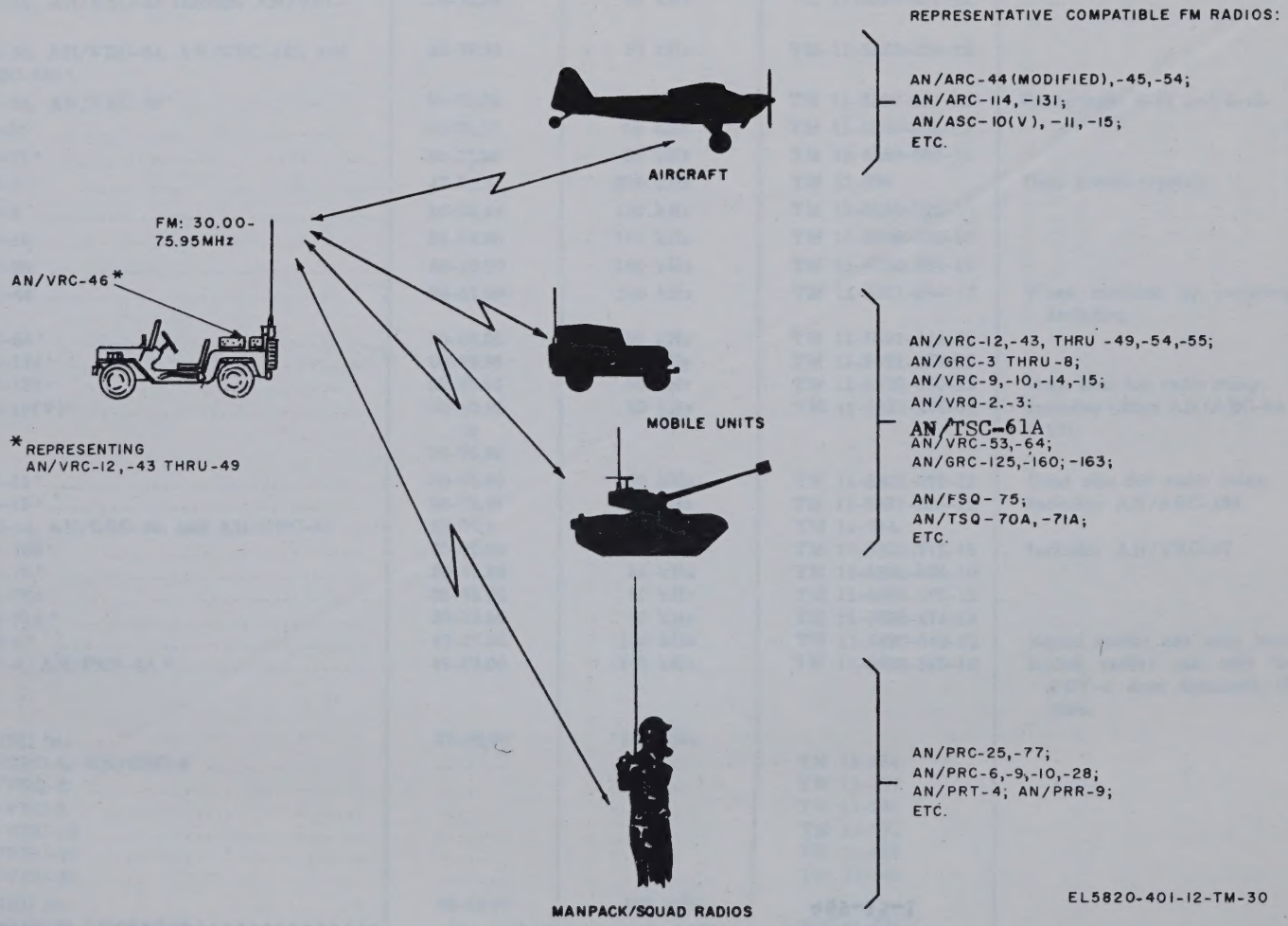


Figure 1-2. Typical radio sets compatible with AN/VRC-12 series radios.

b. AN/VRC-12 Series Radios Configurations. Figures 1-3 through 1-6 display the various configurations of the AN/VRC-12 series radios. Each configuration can be used alone or in conjunction with the radio-intercom equipment. Equipment to make the basic AN/VRC-12 series radios operational is discussed in paragraph 1-11.

(1) *Radio Sets AN/VRC-12 and AN/VRC-47* (fig. 1-3). These radio sets include R-442(*)/VRC, a receiver-transmitter, and Antenna AS-1729/VRC.

(*a*) The radio sets are operated in two radio nets. The R-442(*)/VRC is used for receiving in one radio net and the receiver-transmitter for operating in another radio net. The receiver-transmitter can change to the operating frequency of the R-442(*)/VRC to communicate in the R-442(*)/VRC net.

(*b*) Control, Frequency Selector C-2742/VRC is usually used in the AN/VRC-12 configurations to provide remote tuning of the RT-246(*)/VRC.

(2) *Radio Sets AN/VRC-46 and AN/VRC-43* (fig. 1-4). These radio sets include one receiver-transmitter and AS-1729/VRC.

(*a*) The radio sets operate in one radio net.

(*b*) Control, Frequency Selector C-2742/VRC usually is used in AN/VRC-43 configurations to provide remote tuning of the RT-246(*)/VRC.

(3) *Radio Sets AN/VRC-44 and AN/VRC-48* (fig. 1-5). These radio sets include two R-442(*)/VRC's, a receiver-transmitter, and AS-1729/VRC.

(*a*) The radio sets operate in three radio nets, with each R-442(*)/VRC receiving on a different frequency and the receiver-transmitter operating on a third frequency.

(*b*) The receiver-transmitter can change to the operating frequencies of the R-442(*)/VRC's to communicate in their nets.

(*c*) Control, Frequency Selector C-2742/VRC usually is used in AN/VRC-44 configurations to provide remote tuning of the RT-246(*)/VRC.

(4) *Radio Sets AN/VRC-49 and AN/VRC-45* (fig. 1-6). These radio sets include two receiver-transmitters and an AS-1729/VRC for each receiver-transmitter. These radio sets provide radio relay function for radio stations that are too far apart to communicate directly with each other. To perform the relay function, Control, Radio Set C-2299/VRC is required.

(*a*) The radio sets operate in two radio nets with each receiver-transmitter operating on a different frequency.

(*b*) Controls, Frequency Selector C-2742/VRC are used in AN/VRC-45 configurations to provide remote tuning of the RT-246(*)/VRC's.

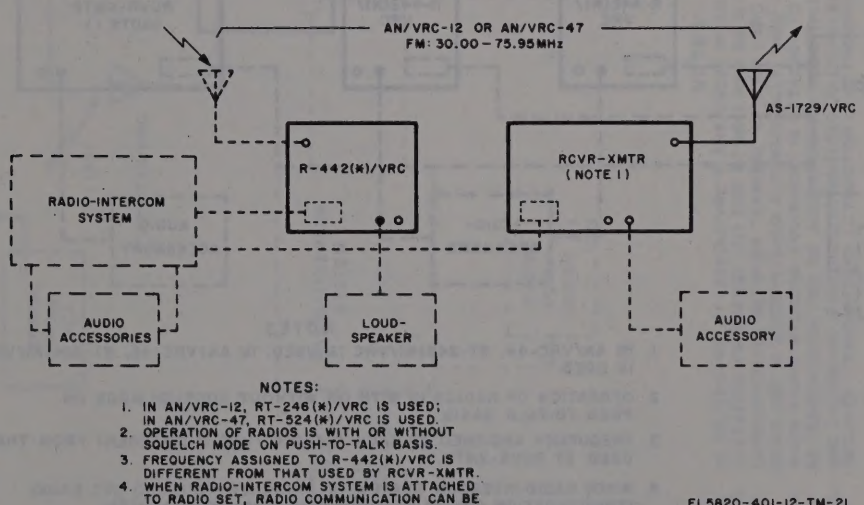
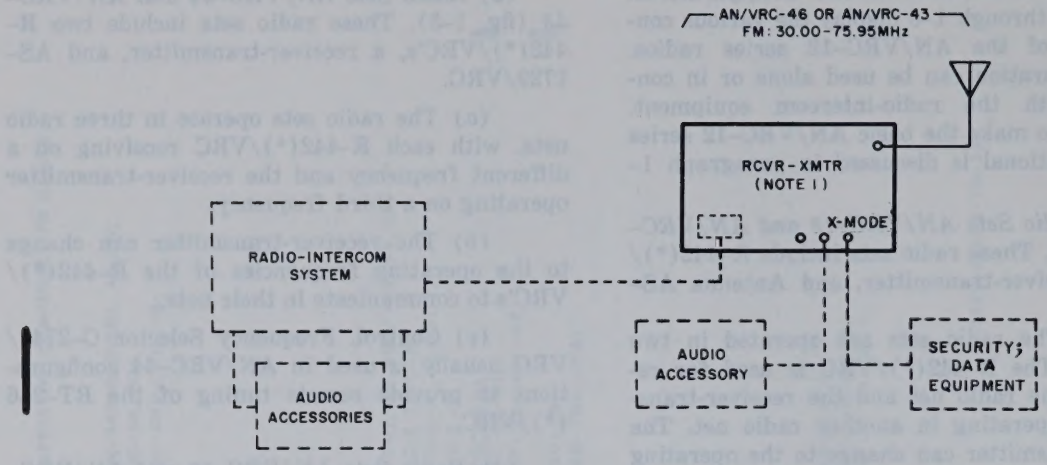

AN/VRC-12 OR AN/VRC-47
FM: 30.00-75.95MHz
AS-1729/VRC
R-442(*)/VRC
RCVR-XMTR
(NOTE 1)
RADIO-INTERCOM SYSTEM
AUDIO ACCESSORIES
LOUD-SPEAKER
AUDIO ACCESSORY
NOTES:
1. IN AN/VRC-12, RT-246(*)/VRC IS USED; IN AN/VRC-47, RT-524(*)/VRC IS USED.
2. OPERATION OF RADIOS IS WITH OR WITHOUT SQUELCH MODE ON PUSH-TO-TALK BASIS.
3. FREQUENCY ASSIGNED TO R-442(*)/VRC IS DIFFERENT FROM THAT USED BY RCVR-XMTR.
4. WHEN RADIO-INTERCOM SYSTEM IS ATTACHED TO RADIO SET, RADIO COMMUNICATION CAN BE ACCOMPLISHED FROM THIS SYSTEM.
EL5820-401-12-TM-21

Figure 1-3. Radio Sets AN/VRC-12 and AN/VRC-47, system application.

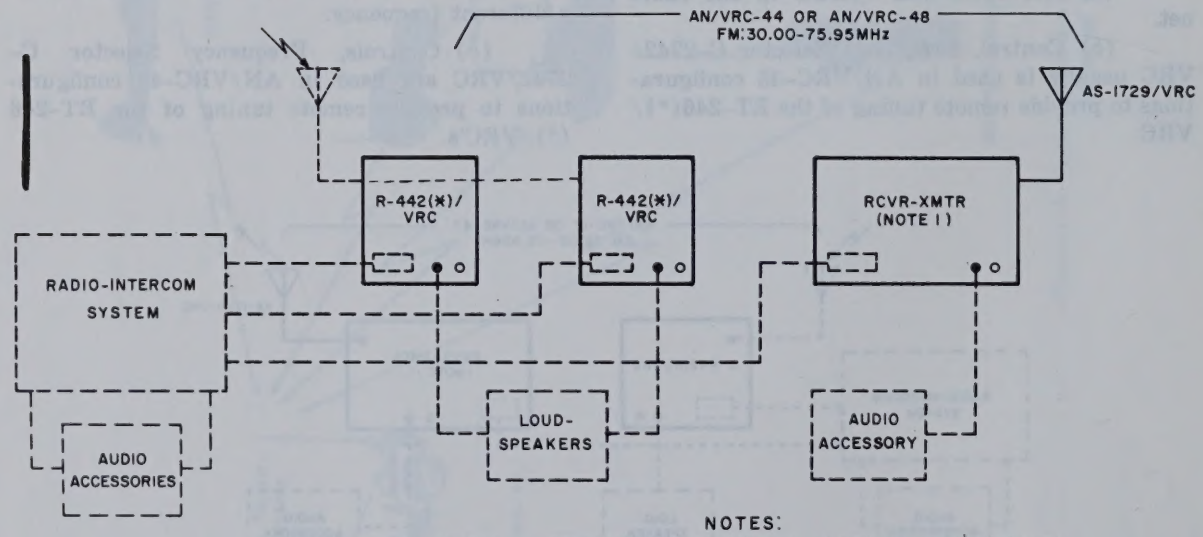


NOTES:

1. IN AN/VRC-46, RT-524(*)/VRC IS USED; IN AN/VRC-43, RT-246(*)/VRC IS USED.
2. OPERATION OF RADIOS IS WITH OR WITHOUT SQUELCH MODE ON PUSH-TO-TALK BASIS.
3. WHEN RADIO-INTERCOM SYSTEM IS ATTACHED TO RADIO SET, RADIO COMMUNICATION CAN BE ACCOMPLISHED FROM THIS SYSTEM.

EL5820-401-12-TM-22

Figure 1-4. Radio Sets AN/VRC-46 and AN/VRC-43, system application.

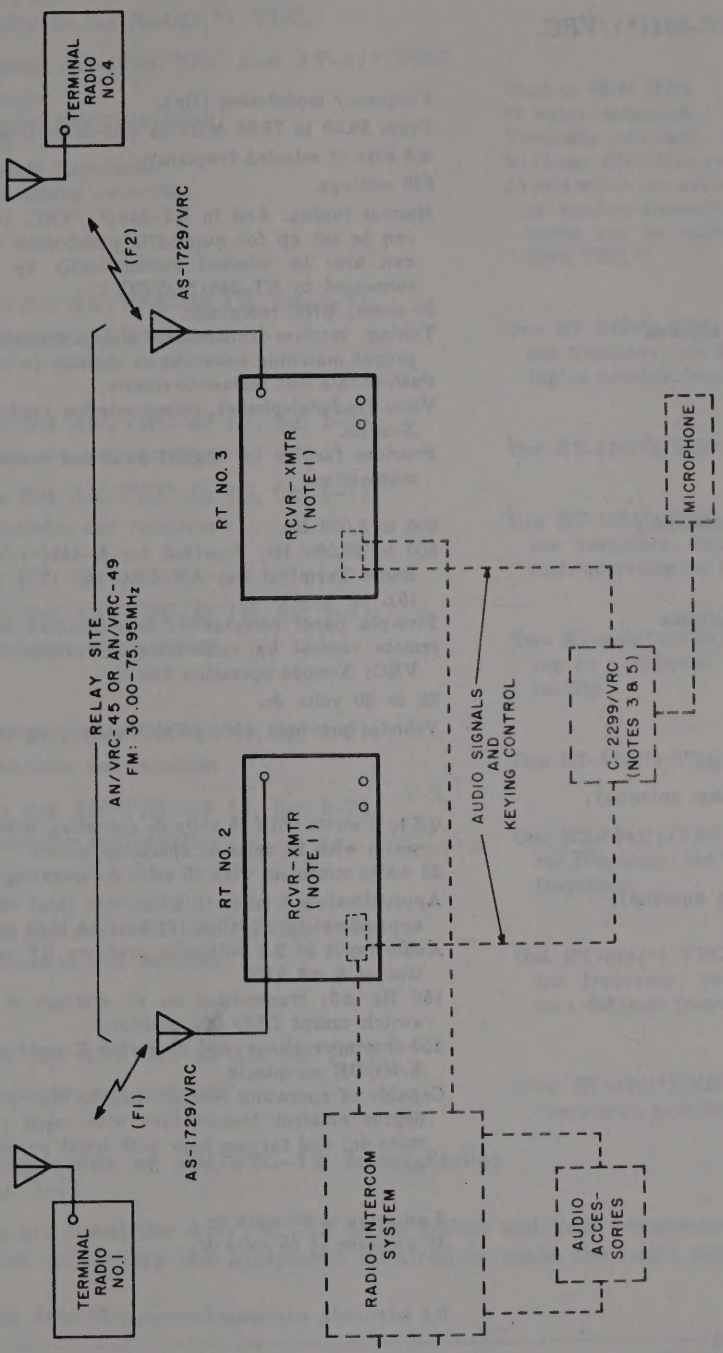


NOTES:

1. IN AN/VRC-44, RT-246(*)/VRC IS USED: IN AN/VRC-48, RT-524(*)/VRC IS USED.
2. OPERATION OF RADIOS IS WITH OR WITHOUT SQUELCH MODE ON PUSH-TO-TALK BASIS.
3. FREQUENCY ASSIGNED TO EACH R-442(*)/VRC IS DIFFERENT FROM THAT USED BY RCVR-XMTR.
4. WHEN RADIO-INTERCOM SYSTEM IS ATTACHED TO RADIO SET, RADIO COMMUNICATION CAN BE ACCOMPLISHED FROM THIS SYSTEM.

EL5820-401-12-TM-23

Figure 1-5. Radio Sets AN/VRC-44 and AN/VRC-48, system application.



NOTES:

1. IN AN/VRC-45, RT-246(*)/VRC'S ARE USED; IN AN/VRC-49, RT-524(*)/VRC'S ARE USED.
2. OPERATING FREQUENCY (F1) FOR RT NO. 1 AND NO. 2 IS DIFFERENT FROM THAT USED BY RT NO. 3 AND NO. 4 (F2).
3. COMMUNICATION BETWEEN TERMINAL RT'S NO. 1 AND 4 IS CONDUCTED IN SQUELCH MODE ON PUSH-TO-TALK BASIS AND IS ACCOMPLISHED AUTOMATICALLY THRU RELAY SITE RADIOS (RT NO. 2 AND 3) AND C-2299/VRC.
4. WHEN RADIO-INTERCOM EQUIPMENT IS ATTACHED TO THE RADIO SET, RADIO COMMUNICATION AND RETRANSMISSION CAN BE ACCOMPLISHED FROM THIS SYSTEM.
5. ONE C-2299/VRC IS PROVIDED (CONNECTED TO EITHER RADIO-INTERCOM OR THE RADIOS). IT IS REQUIRED TO ENABLE RECEIVER-TRANSMITTERS TO FUNCTION IN RETRANSMISSION MODE.

Figure 1-6. Radio Sets AN/VRC-49 and AN/VRC-45, system application.

1-8. Technical Characteristics

a. RT-246(*)/VRC and RT-524(*)/VRC.

(1) *General.*

Type of modulation	Frequency modulation (fm).
Frequency range	From 30.00 to 75.95 MHz at 0.05-MHz intervals.
Frequency stability	±3 kHz of selected frequency.
Number of frequency settings	920 settings.
Tuning facility	Manual tuning. And in RT-246(*)/VRC, 10 frequencies can be set up for automatic pushbutton tuning which can also be selected automatically by C-2742/VRC connected to RT-246(*)/VRC.
Antenna receptacle impedance	50 ohms; BNC receptacle.
Control of matching networks in antenna	Tuning receiver-transmitter also automatically selects proper matching networks in antenna (*c* below).
Operating conditions	Push-to-talk and release-to-receive.
Modes of operation	Voice (radiotelephone), retransmission (radio relay), and X-mode.
X-mode operation	Provides facility for digital data and secure voice communication.
Audio response capability:	
Narrow band (usual mode of operation)	500 to 3,000 Hz.
Wide band	500 to 20,000 Hz. Provided for R-442(*)/VRC used in Radio Terminal Set AN/GRC-163 (TM 11-5820-713-15).
Audio input and output control facilities	Five-pin panel receptacles; rear-mounted receptacle for remote control by radio-intercom system and C-2299/VRC; X-mode operation facility.
Operating power	22 to 30 volts dc.
Used in	Vehicles provided with 24-volt battery system

(2) *Transmitting features.*

Output RF power (into ideal 50-ohm antenna):	
Low power	0.5 to 8 watts with 25 volts dc operating power; 0.5 to 10 watts with 30 volts dc operating power.
High power	35 watts minimum with 25 volts dc operating power.
Transmission distance (using whip antenna)	Approximately 5 miles (8 kilometers (km) on low power; approximately 25 miles (41 km) on high power.
Carrier deviation	Audio input of 2.8 millivolts produces RF carrier deviation of 8 ±2 kHz.
Squelch tone signal	150 Hz ±3; transmitted on all settings of SQUELCH switch except OLD ON position.
Audio input impedance	150-ohm microphone; 600 ohms for X-mode operation (at X-MODE receptacle.
Duty cycle	Capable of operating continuously in high power in 120-degree ambient temperature with input power of 22 volts dc; and for one hour with input power of 30 volts dc.
Power drain:	
Using low power	3 amperes at 25 volts dc.
Using high power	10 amperes at 25 volts dc.

(3) *Receiving functions.*

RF signal sensitivity	0.1 microvolt, minimum.
Audio output impedances (nominal):	
External loudspeaker	160 ohms.
Headphone	150 ohms.
To radio-intercom system	1,800 ohms.
X-mode	600 ohms.
Squelch types:	
Carrier (operative in OLD SQUELCH)	Responsive to carrier noise (approximately 7,300 Hz).
Tone (operative in NEW SQUELCH)	Responsive to 150-Hz squelch tone signal.
Power drain	0.75 ampere at 25 volts dc.

b. R-442(*)/VRC. The technical characteristics given in *a*(3) above for the receiver-transmitters are applicable to the R-442(*)/VRC.

c. Antennas AS-1729/VRC and AT-912/VRC.

Frequency range	30.00 to 76.00 MHz.
RF transmission power capability	70 watts maximum.
Antenna type	Vertically polarized, omnidirectional whip antenna.
Radio receptacle impedance	50 ohms; BNC type receptacle.
Frequency matching networks	10 sets which are automatically selected by tuning controls of receiver-transmitter. In AS-1729/VRC, these networks can be selected manually by control on MX-6707/VRC.

d. Radio Set AN/VRC-12 (E, fig. 1-7).

Radio transmission and reception	One RT-246(*)/VRC (see *a* and *c* above) operating on one frequency; one R-442(*)/VRC (see *b* above) operating on another frequency.

e. Radio Set AN/VRC-43 (F, fig. 1-7).

Radio transmission and reception	One RT-246(*)/VRC; see *a* and *c* above.

f. Radio Set AN/VRC-44 (G, fig. 1-7).

Radio transmission and reception	One RT-246(*)/VRC (see *a* and *c* above) operating on one frequency; two R-442(*)/VRC's (see *b* above), each operating on a different frequency.

g. Radio Set AN/VRC-45 (H, fig. 1-7).

Radio transmission and reception	Two RT-246(*)/VRC's (see *a* and *c* above), each operating on a different frequency; provides retransmission facility.

h. Radio Set AN/VRC-46 (I, fig. 1-7).

Radio transmission and reception	One RT-524(*)/VRC; see *a* and *c* above.

i. Radio Set AN/VRC-47 (J, fig. 1-7).

Radio transmission and reception	One RT-524(*)/VRC (see *a* and *c* above) operating on one frequency; one R-442(*)/VRC operating on another frequency.

j. Radio Set AN/VRC-48 (K, fig. 1-7).

Radio transmission and reception	One RT-524(*)/VRC (see *a* and *c* above) operating on one frequency; two R-442(*)/VRC's, each operating on a different frequency.

k. Radio Set AN/VRC-49 (L, fig. 1-7).

Radio transmission and reception	Two RT-524(*)/VRC's, each operating on a different frequency; provides retransmission facility.

1-9. Components of AN/VRC-12 Series Radios (fig. 1-7)

Following are listed the AN/VRC-12 series radios and their components. Refer to paragraph 1-11 for information concerning the equipment required to make the radio sets operational.

a. Radio Sets Components.

Radio set	Federal stock No.	Qty
Radio Set AN/VRC-12 (E, fig. 1-7) includes:	5820-223-7412	
Receiver-Transmitter, Radio RT-246(*)/VRC [a,d]	5820-892-0623	1
Receiver, Radio R-442(*)/VRC [b,d]	5820-892-0624	1
Antenna AS-1729/VRC (*b* below)	5985-985-9024	1

Radio set	Federal stock No.	Qty
Radio Set AN/VRC–43 (F, fig. 1–7) includes:	5820–223–7415	
Receiver-Transmitter, Radio RT–246(*)/VRC [a,d]	5820–892–0623	1
Antenna AS–1729/VRC (*b* below)	5985–985–9024	1
Radio Set AN/VRC–44 (G, fig. 1–7) includes:	5820–223–7417	
Receiver-Transmitter, Radio RT–246(*)/VRC [a,d]	5820–892–0623	1
Receiver, Radio R–442(*)/VRC [b,d]	5820–892–0624	2
Antenna AS–1729/VRC (*b* below)	5985–985–9024	1
Radio Set AN/VRC–45 (H, fig. 1–7) includes:	5820–223–7418	
Receiver-Transmitter, Radio RT–246(*)/VRC [a,d]	5820–892–0623	2
Antenna AS–1729/VRC (*b* below)	5985–985–9024	2
Radio Set AN/VRC–46 (I, fig. 1–7) includes:	5820–223–7433	
Receiver-Transmitter, Radio RT–524(*)/VRC [c,d]	5820–892–0622	1
Antenna AS–1729/VRC (*b* below)	5895–985–9024	1
Radio Set AN/VRC–47 (J, fig. 1–7) includes:	5820–223–7434	
Receiver-Transmitter, Radio RT–524(*)/VRC [c,d]	5820–892–0622	1
Receiver, Radio R–442(*)/VRC [b,d]	5820–892–0624	1
Antenna AS–1729/VRC (*b* below)	5985–985–9024	1
Radio Set AN/VRC–48 (K, fig. 1–7) includes:	5820–223–7435	
Receiver-Transmitter, Radio RT–524(*)/VRC [c,d]	5820–892–0622	1
Receiver, Radio R–442(*)/VRC [b,d]	5820–892–0624	2
Antenna AS–1729/VRC (*b* below)	5895–985–9024	1
Radio Set AN/VRC–49 (L, fig. 1–7) includes:	5820–223–7437	
Receiver-Transmitter, Radio RT–524(*)/VRC [c,d]	5820–892–0622	2
Antenna AS–1729/VRC	5985–985–9024	2

[a] RT–246(*)/VRC is 6 3/4 inches high; 13 3/8 inches deep, and 15 3/8 inches wide; and weighs 56 1/4 lb.

[b] R–442(*)/VRC is 6 3/4 inches high 13 3/8 inches deep, and 5 3/8 inches wide; and weighs 18 1/4 lb.

[c] RT–524(*)/VRC is 6 3/4 inches high, 13 3/8 inches deep and 15 3/8 inches wide; and weighs 51 lb.

[d] Each receiver-transmitter and R–442(*)/VRC also includes 2 each (spare) Lamp, Incandescent (FSM 6240–155–7836), T–1–3/4 bulb, 28 volts, 0.04 amp. Each receiver-transmitter also includes TM 11-5820-401-12.

b. Antenna AS–1729/VRC (fig. 1–11). The components of the AS–1729/VRC are listed in TM 11–5985–262–15.

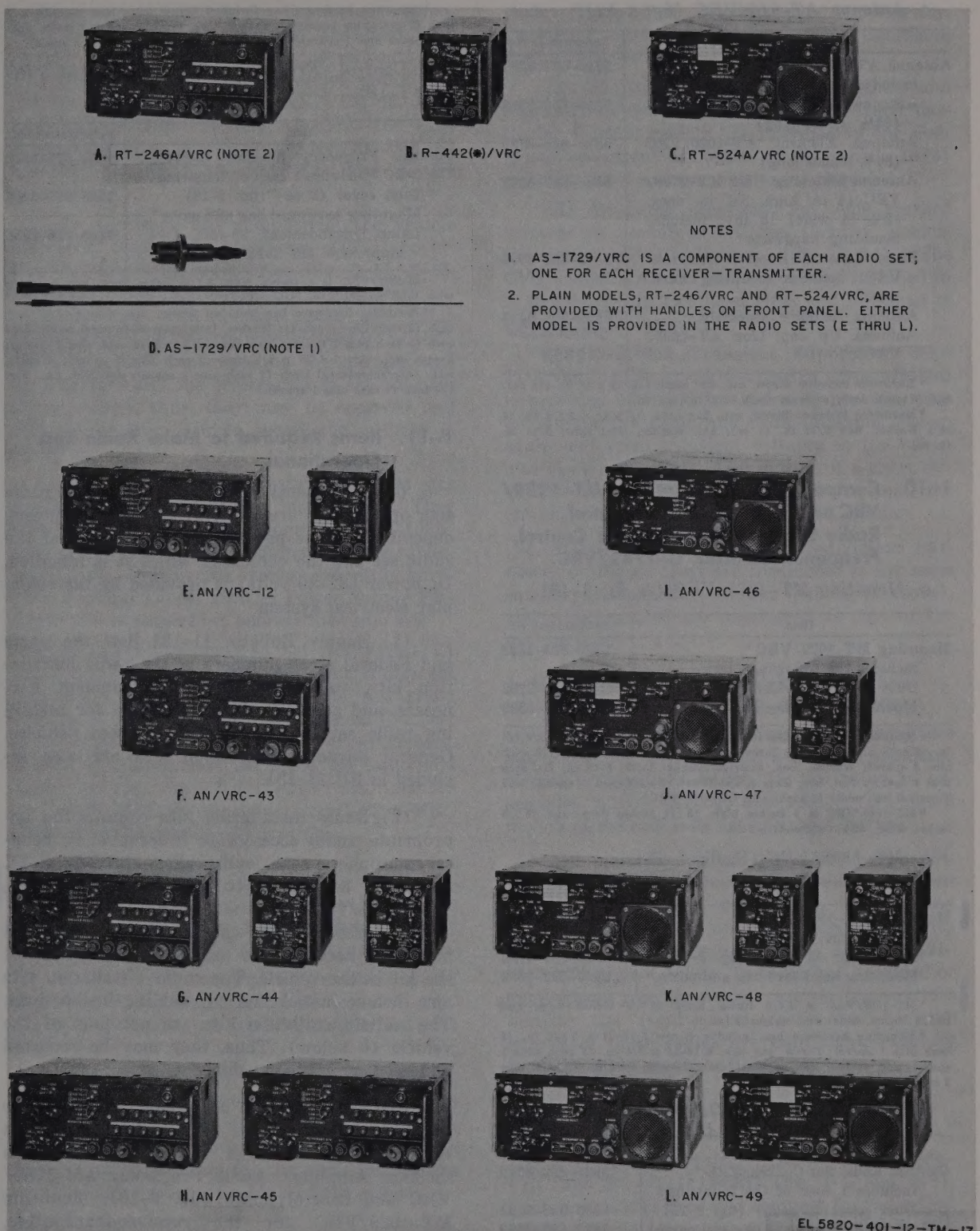

A. RT-246A/VRC (NOTE 2)
B. R-442(*)/VRC
C. RT-524A/VRC (NOTE 2)
D. AS-1729/VRC (NOTE 1)
NOTES
1. AS-1729/VRC IS A COMPONENT OF EACH RADIO SET; ONE FOR EACH RECEIVER-TRANSMITTER.
2. PLAIN MODELS, RT-246/VRC AND RT-524/VRC, ARE PROVIDED WITH HANDLES ON FRONT PANEL. EITHER MODEL IS PROVIDED IN THE RADIO SETS (E THRU L).
E. AN/VRC-12
I. AN/VRC-46
F. AN/VRC-43
J. AN/VRC-47
G. AN/VRC-44
K. AN/VRC-48
H. AN/VRC-45
L. AN/VRC-49
EL 5820-401-12-TM-17

Figure 1-7. AN/VRC-12 series radios.

c. Antenna AT-912/VRC (fig. 1-12).

Item	Federal stock No.
Antenna AT-912/VRC includes 1 each of the following:	5820-897-6357
Antenna Element AT-1095/VRC (64½ inches long)	5820-856-2728
Antenna Element AT-1096/VRC (54½ inches long)	5820-856-2730
Antenna Matching Unit MX-2799/VRC (4 in. high, 5¼ in. deep, 12½ in wide; 10 lb); includes mounting hardware [a]	5820-897-6356
Base, Antenna Support AB-719/VRC; includes mounting hardware [b]	5820-856-2799
Antenna tie-down assembly	5820-908-6416
Antenna tip cap (for AT-1095/VRC)	5820-437-2353

[a] Hardware includes: Screw, cap, hex head; 1/4-28 x 12 in. (12 ea); and Washer, lock, external teeth, 1/4 in. (12 ea).

[b] Hardware includes: Screw, cap, hex head; 5/16-24 x 2 1/4 in. (4 ea); Washer, flat; 5/16 in. (4 ea); and Washer, lock, split; 5/16 in. (4 ea).

1-10. Components of Mountings MT-1029/VRC and MT-1898/VRC; Control, Radio Set C-2299/VRC; and Control, Frequency Selector C-2742/VRC.

a. Mounting MT-1029/VRC (A, fig. 1-13).

Item	Federal stock No.
Mounting MT-1029/VRC [b] includes the following:	5820-893-1323
Dust cover (3 each) (fig. 2-16)	5935-933-3752
Mounting hardware bag and parts [a]	5820-892-3399

[a] Mounting hardware bag includes: Screw, cap, hex; 5/16-24 x 1 1/4 in. (5 each plus 2 spare); Screw, cap, hex; 5/16-24 x 3/4 in. (5 each plus 2 spare); Washer, lock, external-internal tooth; 5/16 in. (10 each plus 4 spare); Nut, hex, class 3, QQ-P-416 (5 each plus 2 spare); and Terminal lug, solder (2 each) (for CX-4720/VRC).

[b] MT-1029/VRC is 5 inches high, 13 1/2 inches deep, and 15 7/8 inches wide; and weighs 17 1/2 lb.

b. MT-1898/VRC (B, fig. 1-13).

Item	Federal stock No.
Mounting MT-1898/VRC [a] includes the following:	5820-893-1324
Dust cover (3 each) (fig. 2-16)	5935-933-3752
Mounting hardware bag and parts [b]	5820-892-3399

[a] MT-1898/VRC is 4 5/8 inches high, 13 1/2 inches deep, and 15 7/8 inches wide; and weighs 9 1/4 lb.

[b] Mounting hardware bag includes: Screw 5/16-24 x 1 1/4 in. (4 each plus 1 spare); Screw, cap hex; 5/16-24 x 3/4 in. (4 each plus 1 spare); and washer, lock, external-internal tooth; 5/16 in. (8 each plus 2 spare).

c. Control, Radio Set C-2299/VRC (fig. 1-17).

Item	Federal stock No.
Control, Radio Set C-2299/VRC [a] includes 1 each of the following:	5820-892-3340
Dust cover (2 each) (fig. 2-16)	5935-933-3752
Mounting hardware bag and parts [b]	5820-892-3399

[a] C-2299/VRC is 4 5/8 inches high, 3 3/8 inches deep, and 6 inches wide; and weighs 2 1/2 lb.

[b] Mounting hardware bag includes: Screw, cap, hex; 6-16/24 x 1 inch (2 each plus 1 spare); Washer, lock, external-internal tooth; 5/16 in. (4 each plus 1 spare); Nut, hex; 5/16 inch (2 each plus 1 spare).

d. Control, Frequency Selector C-2742/VRC (fig. 1-18).

Item	Federal stock No.
Control, Frequency Selector C-2742/VRC [a] includes 1 each of following:	5820-892-3343
Dust cover (2 ea) (fig. 2-16)	5935-933-3752
Mounting hardware bag and parts [b]	
Lamp, incandescent 28-volt, 0.04 amp; type MS 25237-327	6140-155-7836

[a] C-2742/VRC is 4 inches high, 3 1/4 inches deep, and 6 inches wide; and weighs 2 lb.

[b] Mounting hardware bag includes: Screw, cap, hex: 5-16/24 x 1 inch (2 each plus 1 spare); Washer, lock, external-internal tooth; 5/16 inch (4 each plus 1 spare); Nut, hex; 5/16 inch (2 each plus 1 spare); Screw, cap, hex; 1-4/28 x 3/4 inch (2 each plus 1 spare); Washer, lock, external-internal tooth (2 each plus 1 spare); and Nut, cap, hex; 1/4 inch (2 each plus 1 spare).

1-11. Items Required to Make Radio Sets Operational

a. General. Items required to make the radio sets operational are supplied by various means, depending on the particular configuration of the radio set and the vehicle in which it is installed. Dc power (22-30 volts) is provided by the vehicular electrical system.

(1) Supply Bulletin 11-131 lists the parts and Federal stock numbers of the radio installation kits, vehicular electronic equipment harnesses, and accessory kits authorized for installing radio sets in wheeled and tracked vehicles. General purpose installation kits are also included in SB 11-131.

(2) Radio installation kits contain the appropriate audio accessories (microphones, headset-microphone sets, loudspeaker, etc) (fig. 3-11, 3-12, and 3-13), radio mounts (fig. 1-13), R-442(*)/VRC antennas (fig. 2-4, 2-7), interconnecting cables (fig. 2-17), and hardware necessary to mount the equipment of the kit in the vehicle. The radio installation kits also include installation and cabling instructions. The radio installation kits are not part of the vehicle (*b* below). Thus, they may be removed and used on another vehicle.

(3) The electronic equipment harnesses are part of tracked vehicles (*c* below). They include Intercommunication Set AN/VIC-1(V) which includes Amplifier, Audio Frequency AM-1780/VRC and control boxes (fig. 2-16), Mounting MT-1029/VRC for the receiver-transmitter, Mounting MT-1898/VRC for the R-442(*)/VRC, interconnecting and power cables (fig. 2-17 and

2-13), mounting brackets for the various components and cables, and Electrical Transient Suppressor MX-7778/GRC. These components are provided for the AN/VRC-12 series radios and also for vehicular radio sets AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 (TM 11-5820-498-12), Radio Sets AN/VRC-54 and AN/VRC-55 (fig. 6-13 and 6-17), and similar radio sets.

(4) Accessory kits complement the vehicle electronic equipment harnesses ((3) above). They include audio accessories (fig. 3-11, 3-12, and 3-13), some interconnecting cables, whip antenna sections with a mast base and cable adapter (fig. 2-4) for use with a R-442(*)/VRC, and instructions for installing the harness and the accessory kit. The accessory kits are not part of the vehicle, thus, they may be removed and used on another vehicle when the vehicle is turned in.

(5) General purpose installation kits are provided for non-vehicular installations. They contain audio accessories, Mountings MT-1029/VRC and MT-1898/VRC, interconnecting cables, power cable, and general purpose mounting hardware. A power supply such as Power Supply PP-2953(*)/U is required to operate the radio set.

(6) Intercommunication Set AN/VIC-1(V) (fig. 2-16) provided in the electronic equipment harnesses ((3) above) includes the AM-1780/VRC with two to four control boxes, C-2298/VRC, depending on the number of crewmembers. In electronic equipment harnesses for tanks and similar vehicles, the AN/VIC-1(V) also includes the C-2297/VRC for the driver and C-2296/VRC mounted on the outside of the vehicle.

b. Wheeled Vehicles.

(1) Representative wheeled vehicles include: Truck, Cargo, 1/4-Ton, 4x4, M151A1; Truck, Cargo, 1 1/4-Ton, 4x4, M715; etc.

(2) The items required for installation and operation of the basic radio sets for each particular vehicle are provided in installation kits (*a*(2) above).

(3) In some AN/VRC-12 installations, Control, Frequency Selector C-2742/VRC and Radio Set Control C-2299/VRC are provided. The C-2299/VRC, in this instance, is provided as a convenient connection for the audio accessories used by the operator for control of the radio.

c. Tracked Vehicles.

(1) Representative tracked vehicles include: Tank, Full Tracked, M60A1; Carrier, Personnel, Armored, M113; Carrier, Command Post, M577; etc.

(2) The items required for installation and operation of the basic radio sets for each particular tracked vehicle are provided in the electronic equipment harnesses of the vehicle (*a*(3) above) and an accessory kit (*a*(4) above).

(3) An audio accessory for some tracked vehicles is contained in the Combat Vehicle Crewman (CVC) Helmet (fig. 3-14). The CVC helmet with the audio accessory installed in it is provided in two head sizes and is issued to each individual crewman.

(4) Electrical Transient Suppressor MX-7778/GRC (TM 11-5915-223-12) or equivalent is provided in tracked vehicles. It provides protection for the radio and radio-intercom system equipment from transient voltages in the vehicular electrical system. Also in case of a short circuit in the radio or radio-intercom system, the circuit breaker in the MX-7778/GRC opens.

d. Marine Craft. Generally, installation harnesses in marine craft are considered in the same category as those for tracked vehicles (*c* above), and once installed are considered as part of the marine craft.

1-12. Differences in Models of Receiver-Transmitters and R-442(*)/VRC

a. The -A models of the receiver-transmitters and R-442(*)/VRC contain a filament regulator circuit in assembly A1000 for the tubes in assemblies A1200, A1300, and A1400. The plain models of the radios do not have this feature.

b. All plain models of the receiver-transmitters have a pair of handle assemblies installed over the front panel guards (A, fig. 1-8 and 1-9). The handles are applied in accordance with Modification Work Order (MWO) 11-5320-401-20/1 (28 August 1969). They are not provided or authorized for -A model receiver-transmitters because the front panel receptacles for the guards of these radios are built more ruggedly than the plain model radios.

1-13. Description of AN/VRC-12 Series Radios and Their Components

a. Receiver-Transmitters, Radio RT-246(*)/VRC and RT-524(*)/VRC (fig. 1-8 and 1-9). Each unit is a rugged and compact fm radio that provides radio communication on a push-to-talk basis.

(1) Each unit is housed in a watertight case. The front panel contains all operating controls and also receptacles for audio accessories, antenna, and X-mode equipment. A receptacle in the rear for connection to the MT-1029/VRC provides for the passage of dc power and audio and control signals between the receiver-transmitter and associated equipment such as the radio-intercom system or C-2299/VRC. A small blower in the rear takes in air and blows it over a heat exchanger (fig. 5-1) to dissipate heat from the radio. Watertight covers on the top and bottom of the radio are removed to gain access to the radio for troubleshooting and repair. Handles are provided in plain models and not on -A models of the receiver-transmitters (para 1-12*b*).

(2) The RT-246(*)/VRC and RT-524(*)/VRC differ from each other in the following ways:

(*a*) The RT-246(*)/VRC has an automatic tuning system which is controlled by front panel pushbuttons. Automatic tuning can also be controlled by a C-2742/VRC connected to the RT-246(*)/VRC. The RT-524(*)/VRC does not have this feature.

(*b*) The RT-524(*)/VRC has a loudspeaker in the front panel; the RT-246(*)/VRC does not.

b. Receiver, Radio R-442(*)/VRC. This unit is a rugged and compact fm radio receiver housed in a watertight case. The front panel contains all operating controls and also receptacles for connection of audio accessories and an antenna. A receptacle in the rear for connection to the MT-1898/VRC provides for the passage of dc power to the R-442(*)/VRC. The receptacle also provides the passage of audio signals between the receiver and associated equipment such as the radio-intercom system.

c. Antenna AS-1729/VRC and Antenna AT-912/VRC. The antennas are omnidirectional, vertically polarized whip antennas, for use with the receiver-transmitters mounted in vehicles. Each antenna contains two antenna elements that are mounted on a matching unit containing antenna tuning networks for 10 frequency bands. The proper network is automatically selected by the tuning circuits of the receiver-transmitter with which it is connected. The antenna elements are made of rigid fiberglass in which is embedded a basket-weave radiating metal element. The AS-1729/VRC is more compact than and weighs less than the AT-912/VRC, and has a manual control for tuning. Assembled units are approximately 9½ ft long.

(1) *Antenna AS-1729/VRC* (fig. 1-11 and A, fig. 2-1).

(*a*) The MX-6707/VRC is attached to the vehicle. The spring section on one end permits the antenna elements to bend without breaking. Receptacles for the control cable and antenna cable, and a band control are located on the other end. The receptacles and switch are protected by studs; one stud is threaded so that it can be used for securing a ground strap. The band control is automatically moved by the tuning circuits of the receiver-transmitter; it can also be moved manually.

(*b*) A spring-loaded contact on the bottom of the AS-1730/VRC transfers RF energy to and from the contact at the top of the spring section on the MX-6707/VRC.

(2) *Antenna AT-912/VRC* (fig. 1-12 and B, fig. 2-1).

(*a*) The MX-2799/VRC is attached to the vehicle. The AB-719/VRC is attached to the end or side of the MX-2799/VRC as applicable to the vehicle installation. The spring section of the AB-719/VRC permits the installed antenna elements to bend without breaking.

(*b*) Receptacles for the control cable and antenna cable are located on one end of the MX-2799/VRC and are protected by a bar.

(*c*) RF energy is transferred to and from the spring-loaded contact in the AT-1096/VRC through the contact on the top of the spring of the AB-719/VRC and the two-conductor lead to the BNC receptacle of the MX-2799/VRC.

1-14. Description of Mountings MT-1029/VRC and MT-1898/VRC; Control, Frequency Selector C-2742/VRC; and Control, Radio Set C-2299/VRC

a. Mountings MT-1029/VRC and MT-1898/VRC. The MT-1029/VRC (A, fig. 1-13) is used with the receiver-transmitters (fig. 1-14 and 1-15); the MT-1898/VRC (fig. 1-13) is used with the R-442(*)/VRC (fig. 1-16). The radio is installed and clamped to the radio mount which in turn is bolted to the vehicle. Each radio mount has a radio receptacle (fig. 2-7 and 2-8) which mates with the receptacle at the rear of the radio for the passage of power and transmitted and received audio signals between the radio and other equipment such as radio-intercom system or the retransmission control box, C-2299/VRC (*b* below). The mount also has receptacles for connection of power and control cables to other equip-

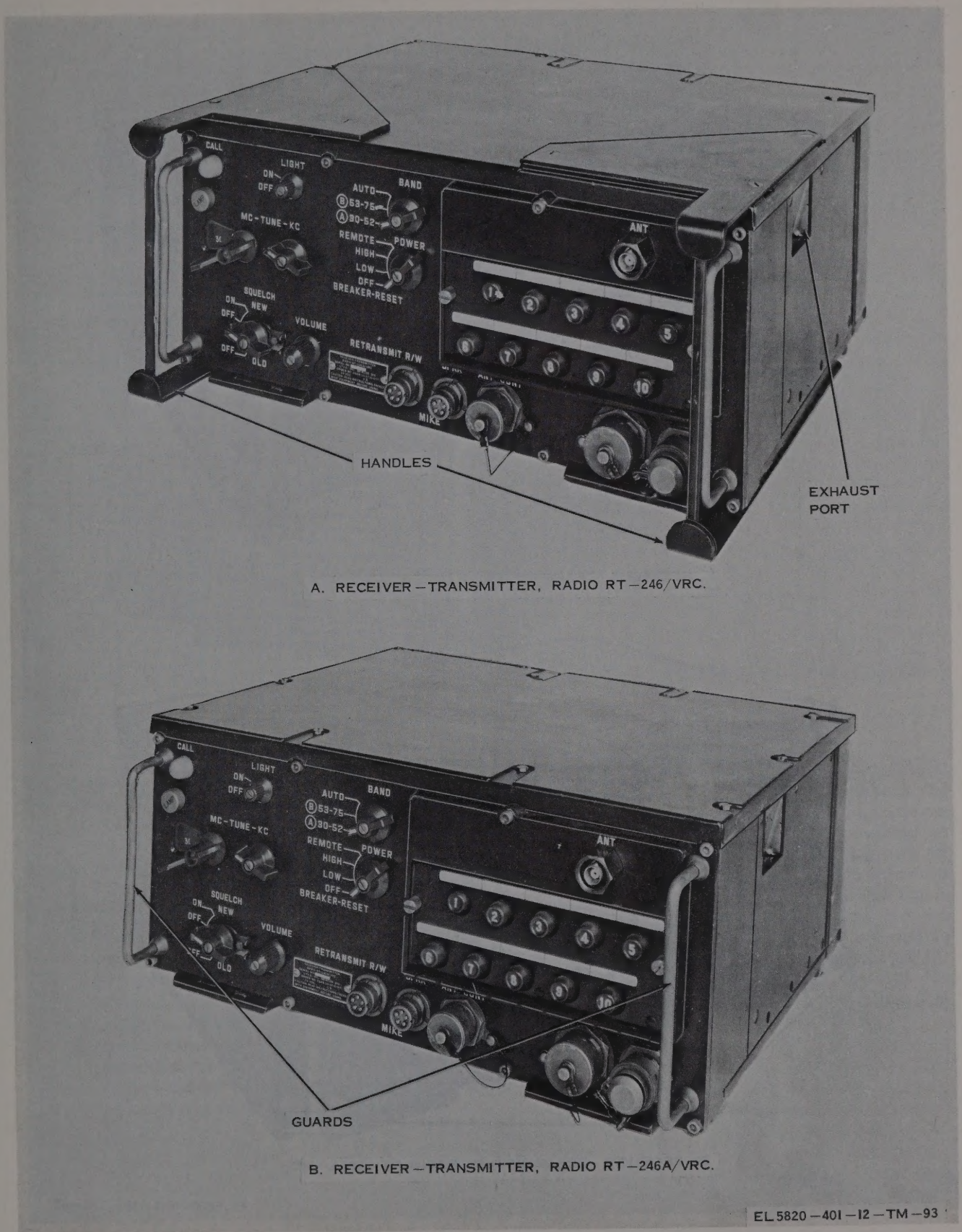


Figure 1-8. Receiver-Transmitters, Radio, RT-246/VRC and RT-246A/VRC, front views.

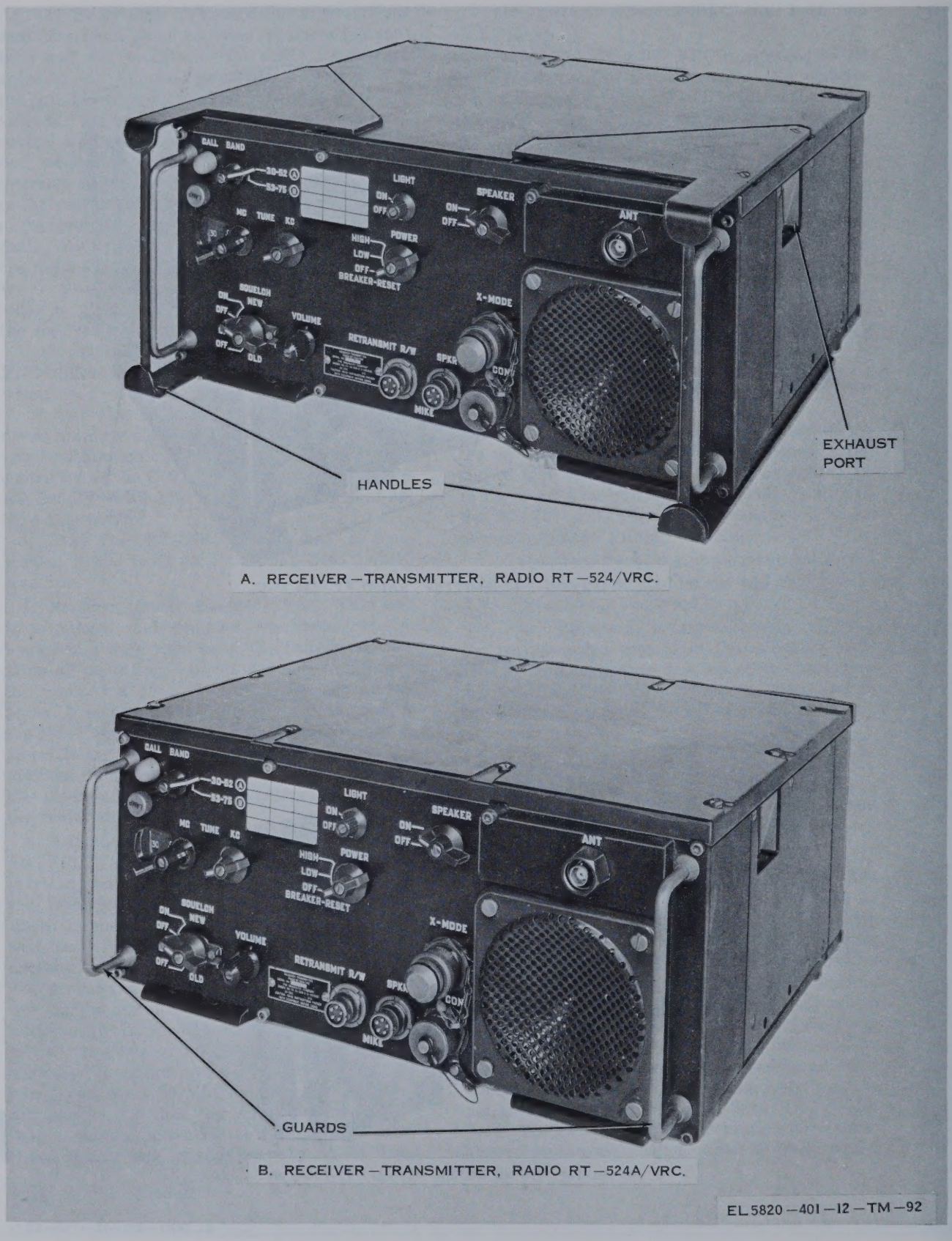


Figure 1-9. Receiver-Transmitters, Radio RT-524/VRC and RT-524A/VRC, front views.

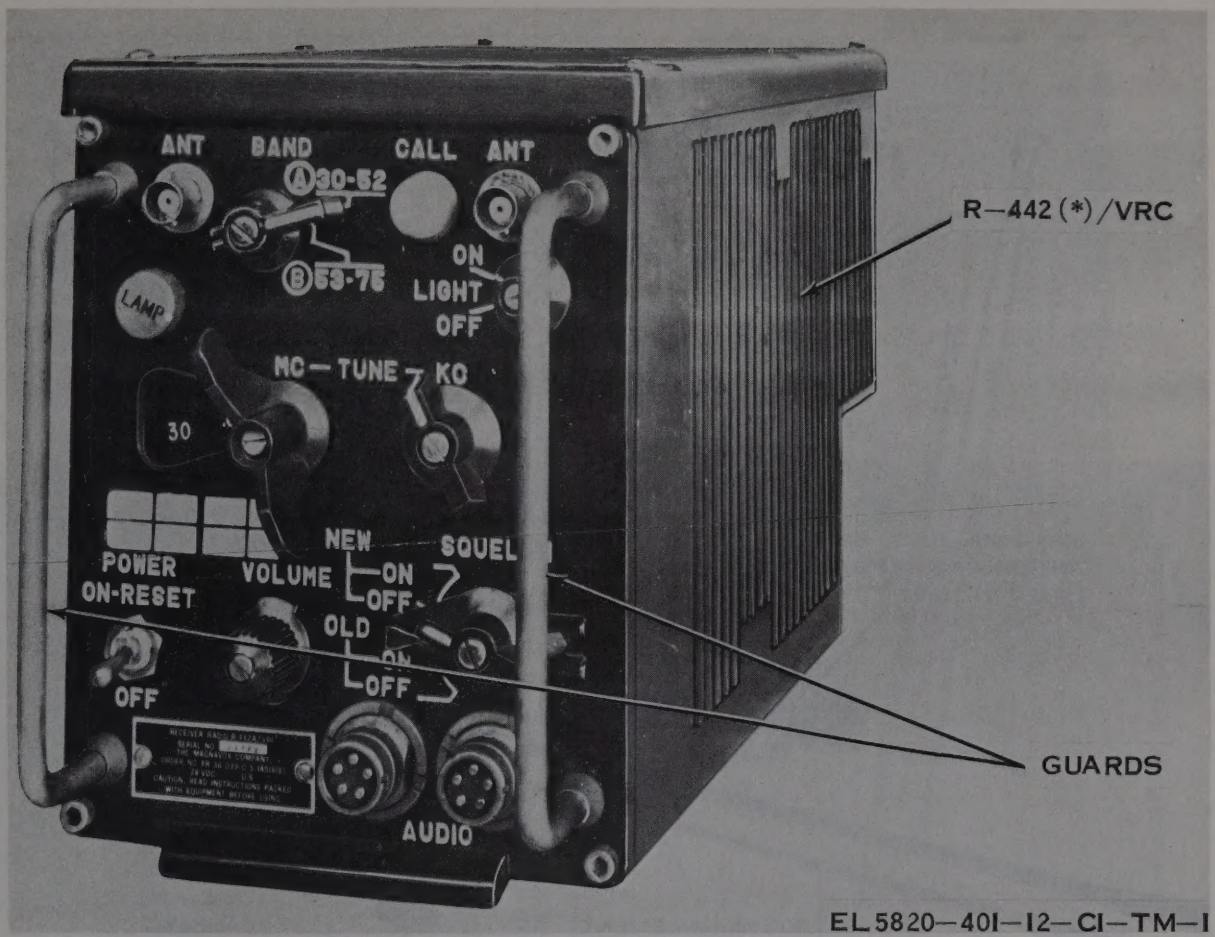


Figure 1-10. Receiver, Radio R-442(*)/VRC, front view.

ment (fig. 2-7 through 2-10). The mountings are made of lightweight metal with a top tray separated from the base assembly by isolator assemblies that act as shock absorbers for the mounted radios. A 100-ampere fuse (fig. 2-11, 2-12) provides protection to the vehicle electrical system from short or ground in the radio mount.

b. Control, Radio Set C-2299/VRC (fig. 1-17). The C-2299/VRC is required in AN/VRC-49 and AN/VRC-45 configurations to enable the two receiver-transmitters to perform automatic retransmission of signals at a relay radio site. In some installations it is provided as a convenient connection for audio accessories to control one receiver-transmitter. It is provided with controls and cable receptacles.

c. Control, Frequency Selector C-2742/VRC (fig. 1-18). The C-2742/VRC is used with the RT-246(*)/VRC to provide remote automatic selection of 10 preset frequencies that have been set up on the RT-246(*)/VRC. It can also turn off the power to the RT-246(*)/VRC and then turn it on for the transmission of low and high transmission power. Cable receptacles are provided for connection to the RT-246(*)/VRC and also to another C-2742/VRC which can also control the radio. When the spring switch is operated, the CONTROL indicator will light indicating that C-2742/VRC has control of the radio.

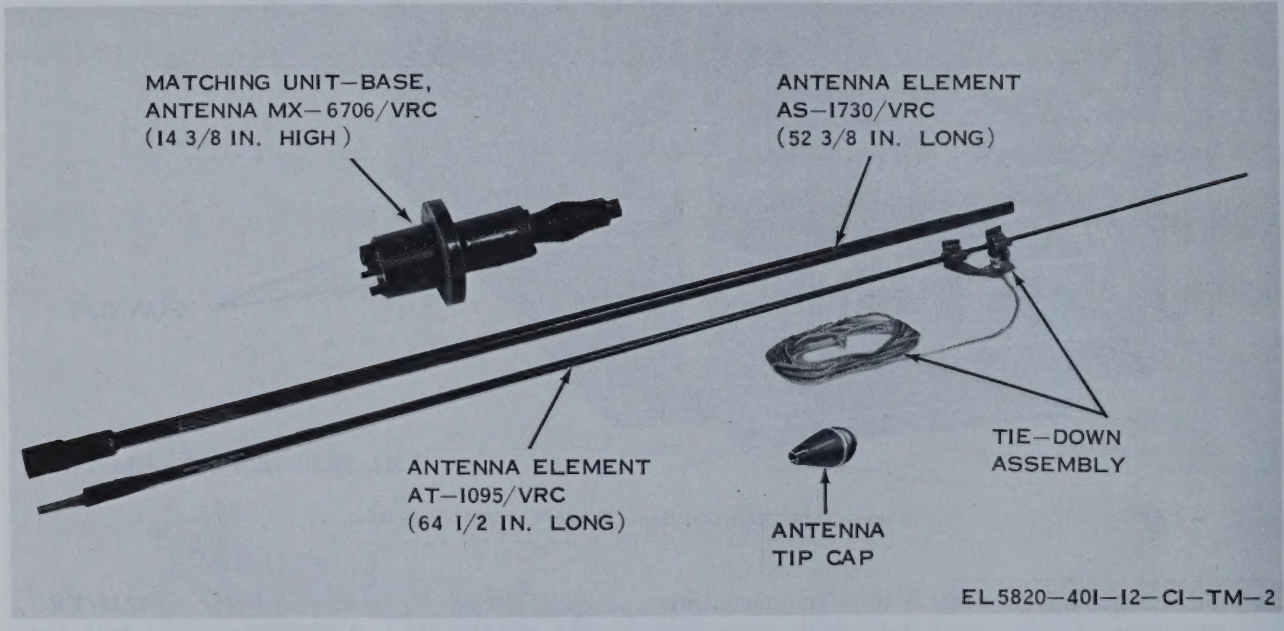


Figure 1-11. Antenna AS-1729/VRC, disassembled.

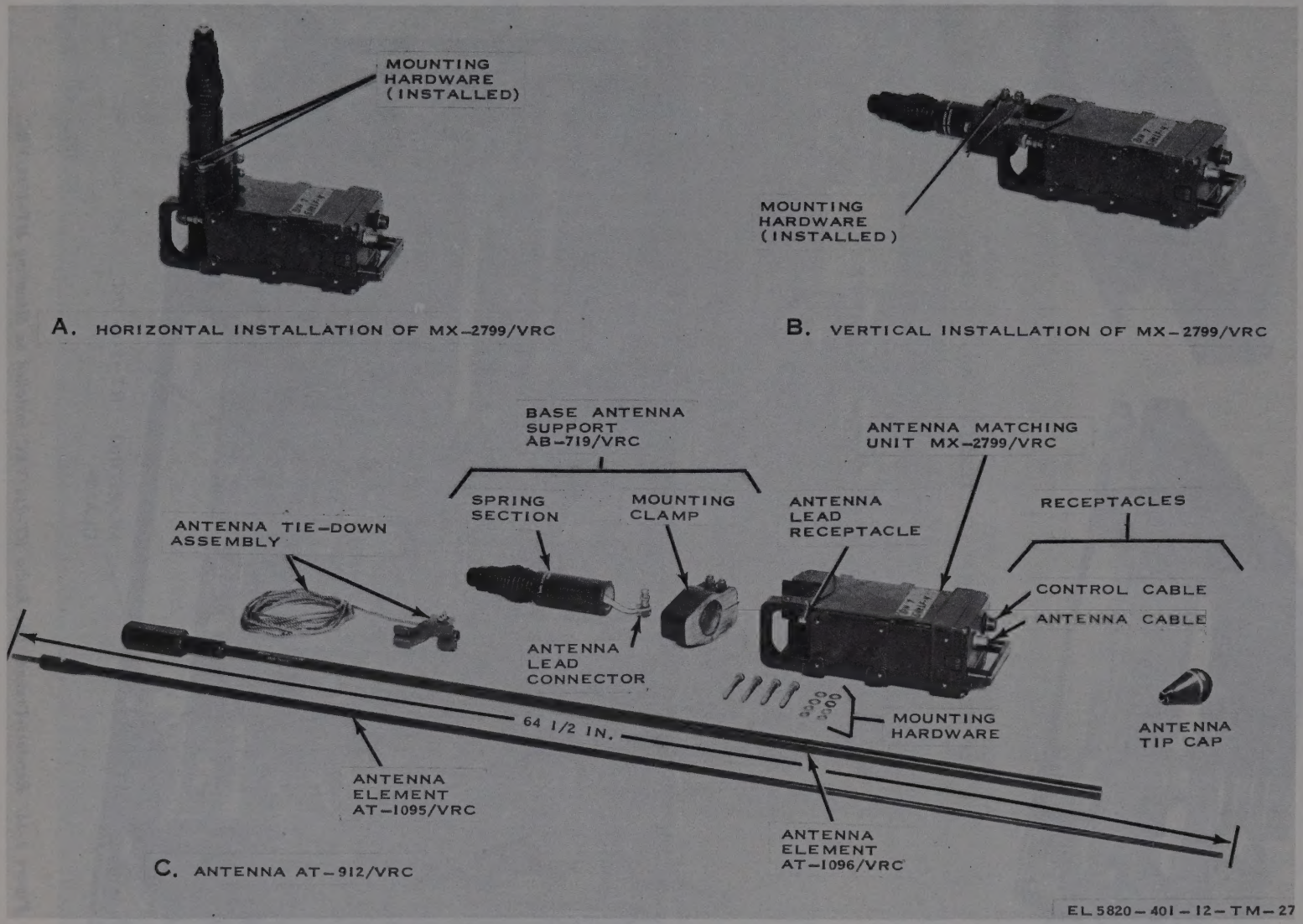


Figure 1-12. Antenna AT-912/VRC, disassembled.

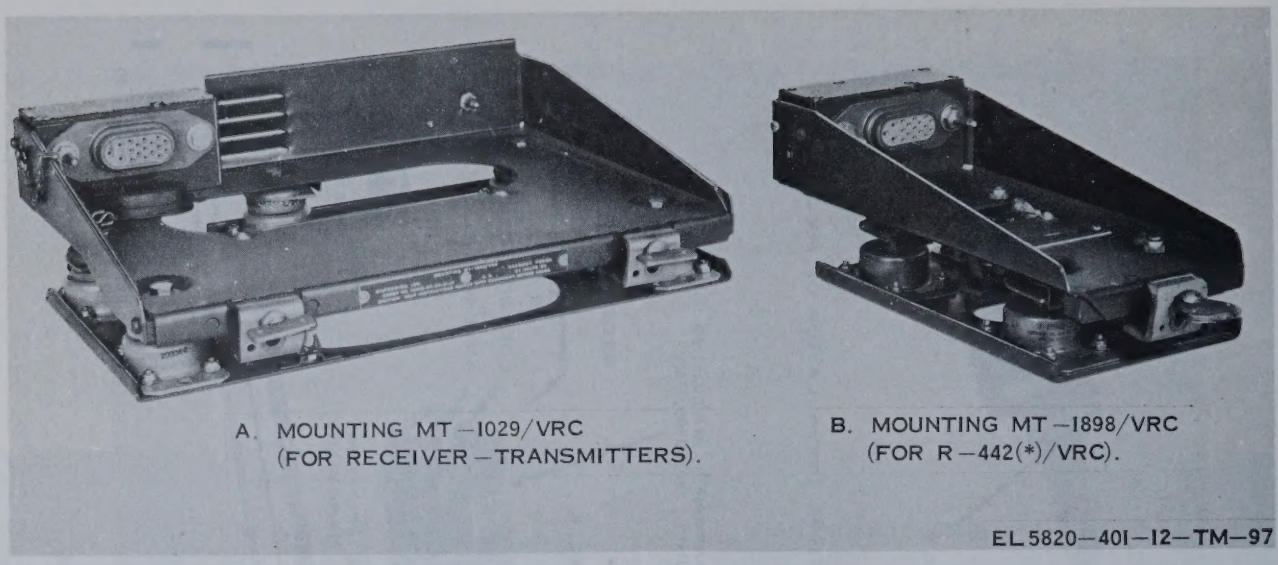


Figure 1-13. Mountings MT-1029/VRC and MT-1898/VRC.

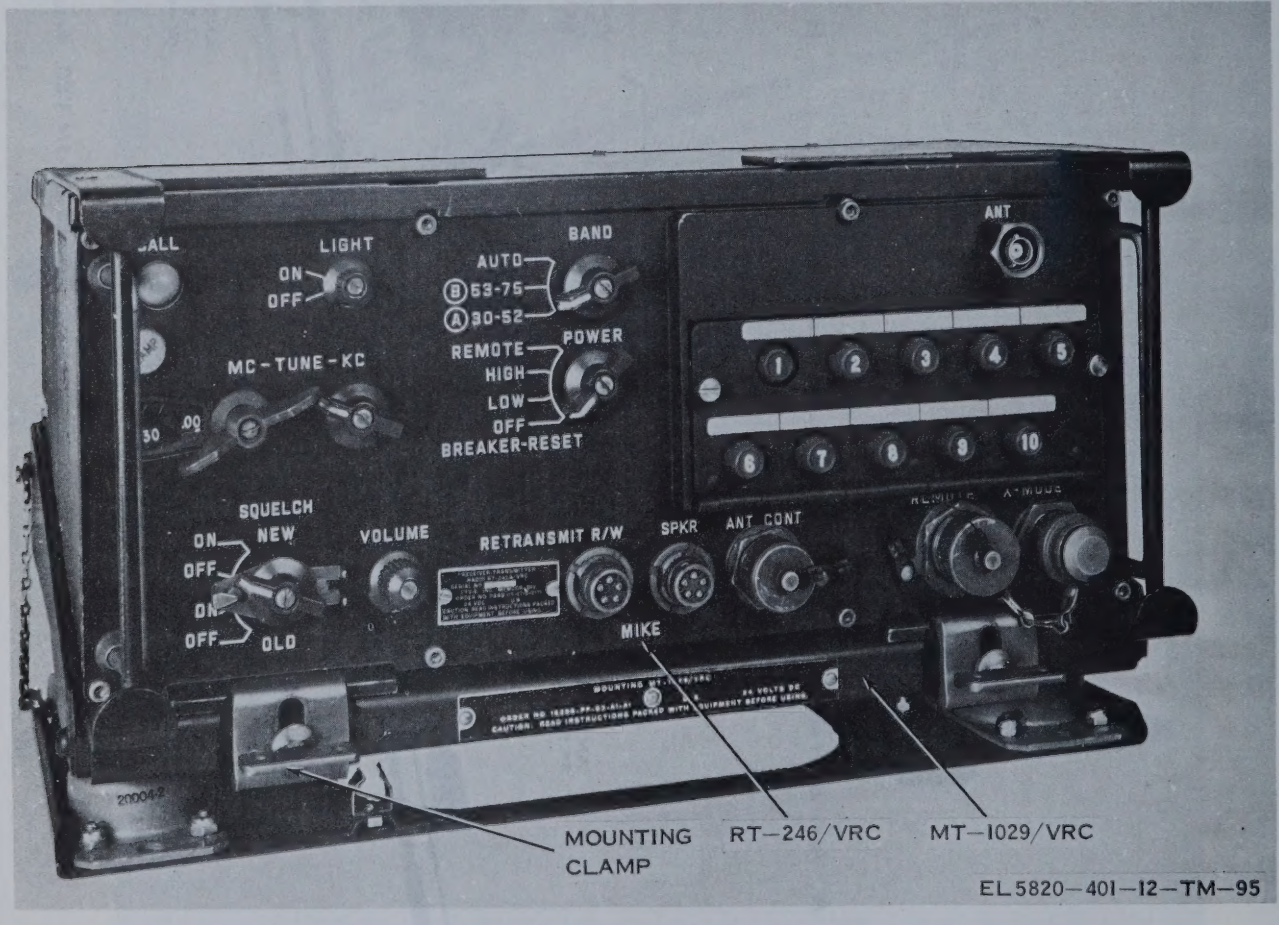


Figure 1-14. Receiver-Transmitter, Radio RT-246/VRC installed on Mounting MT-1029/VRC.

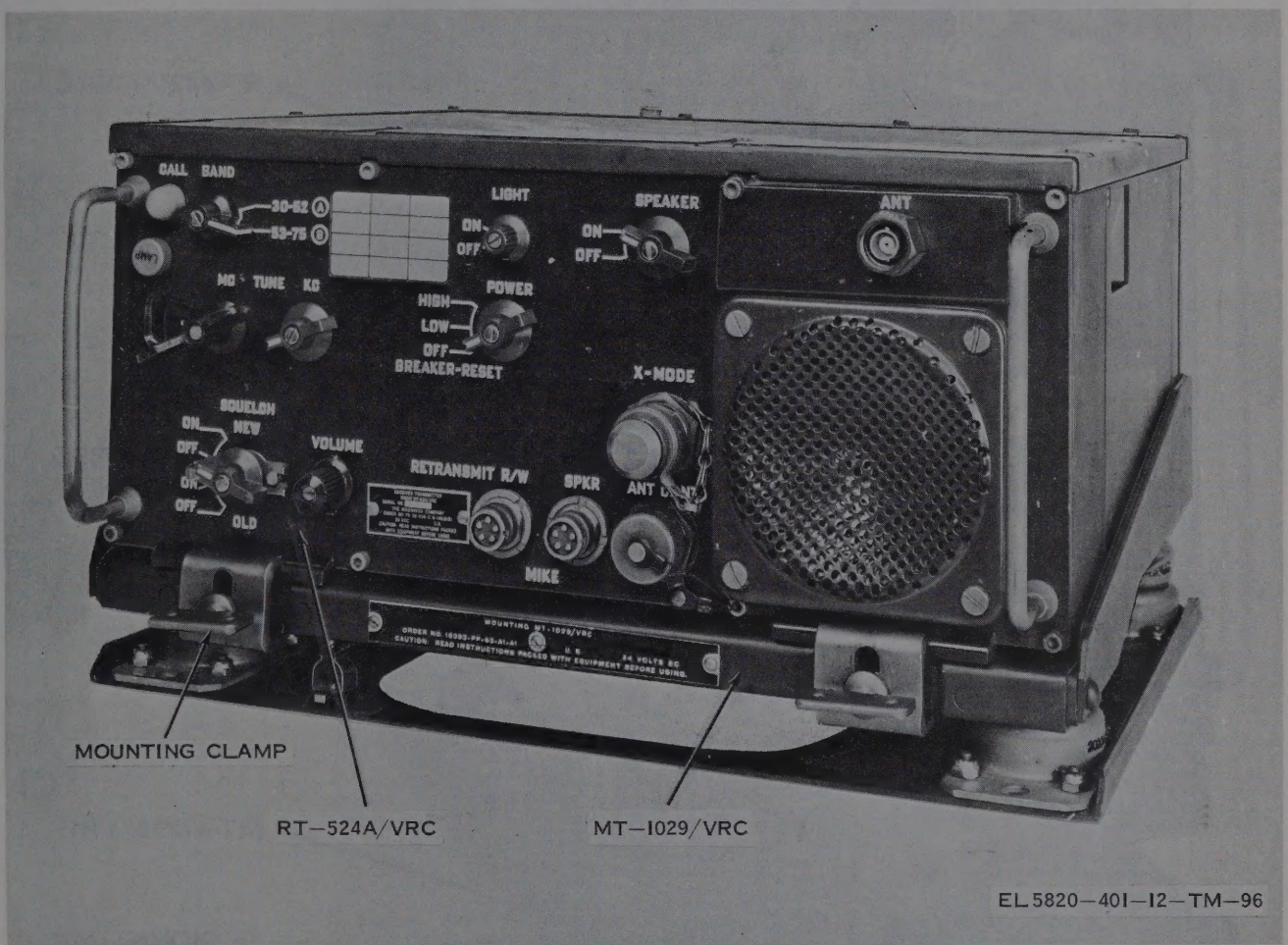


Figure 1–15. Receiver-Transmitter, Radio RT–524A/VRC installed on Mounting MT–1029/VRC.

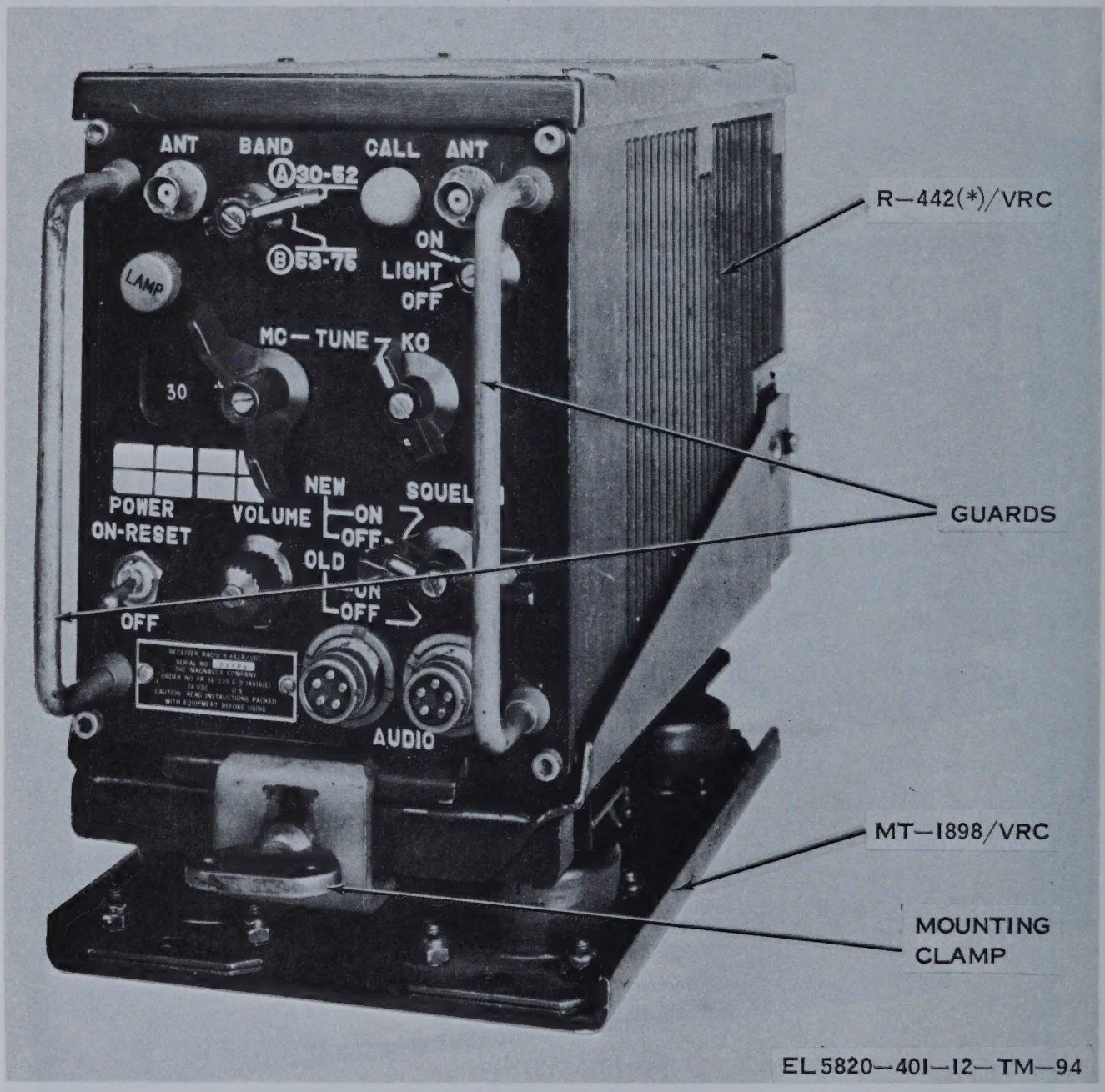


Figure 1-16. Receiver R-442(*)/VRC, installed on Mounting MT-1898/VRC.

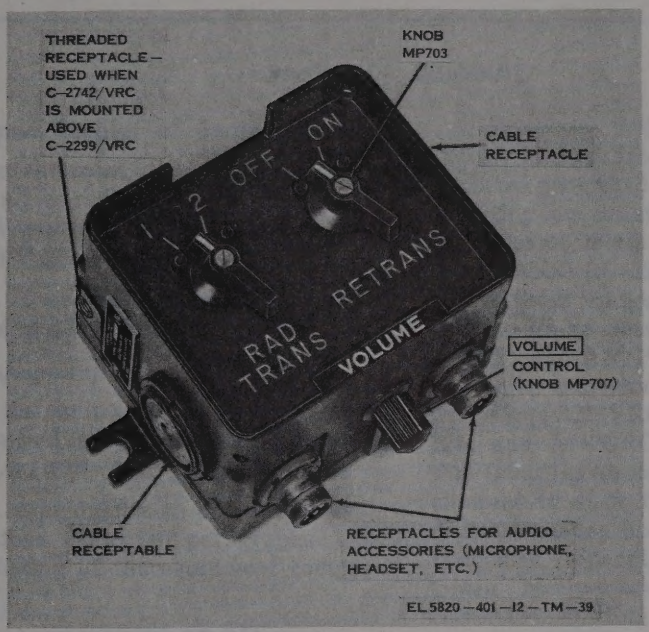


Figure 1–17. Control, Radio Set C–2299/VRC.

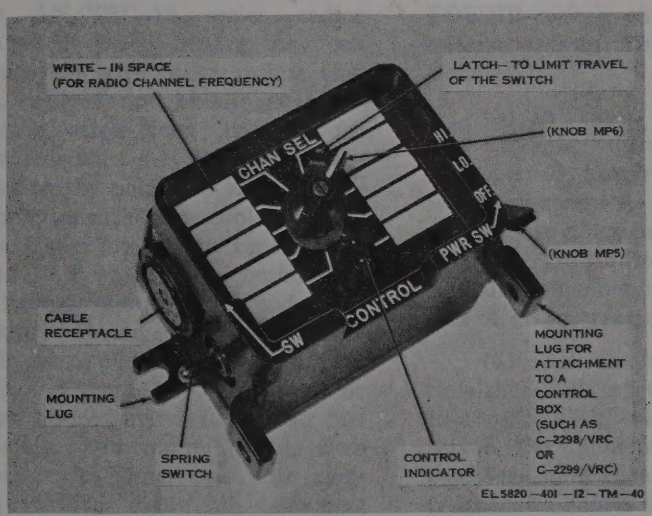


Figure 1–18. Control, Frequency Selector C–2742/VRC.

CHAPTER 2

INSTALLATION OF RADIO SETS

Section I. GENERAL

2–1. Service Upon Receipt of Equipment

When packed for shipment, the components of the AN/VRC–12 series radios are packed in cardboard cartons. When required, the cartons are packed in wooden boxes.

a. Unpacking. If provided, open the wooden boxes; remove the contents from the cartons.

b. Checking Equipment.

(1) Inspect the equipment for possible damage. Report damaged equipment on DD Form 6 per AR 700-58/NAVSUP Pub 378/AFR 71-4.

(2) Use the packing list to check the contents of the cartons. Refer to paragraphs 1–9 and 1–10 for a listing of the equipment components.

(3) Report shortages on SF 364 per AR 735-11-2.

2–2. Siting and Frequency Interference

a. Siting. The AN/VRC–12 series radios should be positioned at places where they can establish communication with other radios (fig. 1–2). Trees, hills, bridges, and buildings can obstruct some communication links; however fm transmission characteristics and the use of the omnidirectional, vertically-polarized whip antenna make fm communication possible around many obstructions. Under low power transmission (approximately 0.5 to 8 watts), the communication range is up to approximately 10 land miles (17 kilometers (km)); under high power transmission (35 watts, minimum), the communication range can extend from 10 to 30 miles or more (17 to 50 km, approximately). Greater distance may be possible when communicating with radios in flying aircraft. Experience with communication from various sites will determine whether communication can be conducted. Observe the frequency selection instructions given in *b* below.

b. Frequency Interference and Frequency Selection. Mutual frequency interference problems are often generated when several fm transmitters operating on different frequencies are situated in the same locale. The problem can occur between AN/VRC–12 series radios and also between these radios and low-power fm radios, such as Radio Sets AN/PRC–25 (TM 11–5820–398–12) and AN/PRC–77 (TM 11–5820–667–12) as well as the vehicular versions of these radios: Radio Sets AN/VRC–53, AN/VRC–64, AN/GRC–125, and AN/GRC–160 (TM 11–5820–498–12). The following procedures can be of assistance in eliminating such frequency interference among radios that are operating near each other. The frequency separation requirements apply between receiver-transmitters and between receiver-transmitters and R–442(*)/VRC.

(1) Use low power transmission unless it has been established that communication can only be accomplished on high power. This is accomplished by setting the receiver-transmitter POWER switch on LOW for low power transmission and on HIGH for high power transmission.

(2) In cases of nonmutual interference (*for example,* when frequency A interferes with frequency B, but frequency B does not interfere with frequency A), consider using frequency A on a secure voice net. In this situation, the characteristic transmitter output when operating in a secure voice net is such that it tends to induce less of an interfering signal.

(3) Due to internal interference in the squelch circuit of the receiver-transmitters and R–442(*)/VRC when no signal is being received, the following frequencies should not be used for communication. The interference at these frequencies causes the CALL lamp to light when the SQUELCH switch is set to OLD ON and also quieting (no rushing noise) when the switch is set to the OFF positions.

(*a*) 33.90 MHz
(*b*) 45.20 MHz
(*c*) 56.50 MHz
(*d*) 67.80 MHz

(4) Avoid the use of frequencies which are harmonically related. For example:

(*a*) Do not use frequencies which are separated by exactly 5.75 or 23.00 MHz.

(*b*) Do not use frequencies which are in the order of the second harmonic. For example, the frequency setting of 30.00, 32.65, and 35.00 will possibly interfere with a radio using 60.00, 65.30, and 70.00 MHz, respectively. Changing either the lower frequency or the higher frequency should eliminate the interference that may occur.

(*c*) Use the retransmission interference charts (fig. FO-1) as a guide in selecting frequencies that will not interfere with radios that are continually in close proximity to each other. These charts are used to determine interfering frequencies that should not be selected for use by retransmission configuration radio sets, such as AN/VRC-49 and AN/VRC-45. The black areas indicate mutually interfering frequencies. *For example,* there would be interference between 31.45 MHz and the following 53.70 (±10 kHz), 54.45 MHz (±10 kHz), 55.45 MHz (±10 kHz), 57.30 (±10 kHz), 60.15 (±10 kHz), 61.55 MHz (±10 kHz), etc.

(5) Observe the recommended minimum frequency versus distance restrictions given below.

Minimum frequency separation required	Minimum antenna distance separation (whip antenna or RC-292)	
	Between AN/VRC-12 series radios on HIGH power	Between AN/VRC-12 series radios on LOW power; or between AN/PRC-25 and AN/PRC-77 [a]
10 MHz	5 feet [b]	5 feet
7 MHz	60 feet	10 feet
4 MHz	150 feet	50 feet
2 MHz	400 feet	200 feet
1 MHz	800 feet	350 feet

[a] This includes the vehicular versions of these radios (b above).
[b] This distance is representative of those vehicles in which retransmission radio sets are used (AN/VRC-49 and AN/VRC-45).

2-3. Shelter Requirements

The AN/VRC-12 series radio are rugged, weatherproof radios that can withstand extremes of cold and heat. Accordingly, no particular protective requirements are applicable.

2-4. Non-Vehicular Installations

a. When the AN/VRC-12 series radio are not used in vehicles, general purpose installation kits, which include required audio accessories and some mounting facilities, can be used to provide the equipment needed to make the basic radios operational. However, dc power supply, capable of providing approximately 24 volts dc at 12 amperes is required for each receiver-transmitter. The PP-2953(*)/U can be used for this purpose (para 6-5).

b. Installation instructions are provided with the general purpose installation kits.

c. The AS-1729/VRC may be mounted in a convenient way near the installed radio set to provide dispersion of the RF signals.

d. Antenna Equipment RC-292 may be used as the radio antenna instead of the AS-1729/VRC. Refer to TM 11-5820-348-15 for cabling and installation instructions.

Section II. INSTALLING, ASSEMBLING, DISASSEMBLING, AND HANDLING RADIO EQUIPMENT

WARNING

The receiver-transmitters are compact and heavy (over 50 pounds). Extreme care should be exercised in handling them in order to protect personnel from serious injury and the equipment from damage. Accordingly, observe the proper handling procedures (para 2-5*a*).

CAUTION

Before installing the radios in or removing them from radio mounts, turn off the radio power switches in the system. This applies to the POWER switches of the receiver-transmitters and R-442(*)/VRC's. In addition, when the AM-1780/VRC is part of the system, set its MAIN PWR switch to OFF.

2-5. Handling, Installing, and Removing Receiver-Transmitters

a. Handling Procedures. Refer to paragraph 1-12 for information concerning the guards and handles of the receiver-transmitters.

(1) Make sure the MT-1029/VRC clamp assemblies are locked to hold the receiver-transmitter securely in the radio mount while the vehicle is in motion. To prevent the clamps from coming loose, a safety wire may be tied between the hole in the screw and the plate of one of the clamp assemblies (fig. 2-7).

(2) When pulling the receiver-transmitter from the MT-1029/VRC, grasp both guards (or handles) to pull the unit from the radio mount, *and continue to use both hands to lift* and carry the unit. NEVER CARRY OR LIFT THE RECEIVER-TRANSMITTER BY ONLY ONE OF THE GUARDS (OR HANDLES).

(3) When shipping the receiver-transmitter, tie or brace the unit in the vehicle or transport unit in such a way it will not change its position due to the motion of the vehicle or transport unit. This precaution is required in order to prevent injury to the guards (or handles) and the front panel.

(4) Set the receiver-transmitter on any of its sides, except the rear of the unit. The blower in the rear may be damaged by such objects as stones, metal objects, and mud lying on the ground or floor.

(5) When the receiver-transmitter is removed from the MT-1029/VRC, put the electrical connector cover on the radio receptacle of the MT-1029/VRC (fig. 2-7) to protect the receptacle pin jacks from the effects of weather and dirt.

(6) Before pushing the receiver-transmitter back on the MT-1029/VRC, clean the top surfaces of the MT-1029/VRC and remove the electrical connector cover from the radio receptacle of the MT-1029/VRC. If the receiver-transmitter is jammed against the radio receptacle while the cover is installed on the radio receptacle, the pins in the receiver-transmitter receptacle can be damaged.

b. Installation (fig. 2-20 through 2-27). The MT-1029/VRC should be securely bolted to the mounting surface and the proper cables applicable to the installation should be connected to the receptacles in the rear of the mount (fig. 2-9).

(1) Lift the receiver-transmitter, set it on the MT-1029/VRC, and push it to the back of the MT-1029/VRC. Tighten the MT-1029/VRC clamps to lock the receiver-transmitter on the mount.

(2) Connect the antenna cable, Cable Assembly, Radio Frequency (RF) CG-1773/U between the BNC antenna cable receptacle on the antenna matching unit and the ANT receptacle on the receiver-transmitter. In some installations, Adapter UG-306/U (fig. 2-4 or 2-5) is provided for one end of the CG-1773/U; use it when it is provided.

(3) Connect the control cable assembly, Cable Assembly, Special Purpose, Electrical CX-4722/VRC between the control cable receptacle on the antenna matching unit and the ANT CONT receptacle on the receiver-transmitter.

(4) Where there is a prescribed route and tying facilities for the CG-1773/U and CX-4722/VRC, use them. When there is no prescribed route, it is recommended that the two cables be tied together at approximately two-foot intervals, tied to the vehicle at critical points, and routed from the receiver-transmitter through the bottom of the MT-1029/VRC to the antenna matching unit in such a manner that the cables are not endangered by the movement of equipment or personnel.

(5) When the C-2742/VRC is required to be used with the RT-246(*)/VRC, connect Cable Assembly, Special Purpose, Electrical CX-7059/VRC between REMOTE CONT receptacle on the RT-246(*)/VRC and the *left* receptacle J71 on the C-2742/VRC. When a second C-2742/VRC is provided, the cable connection is between the right receptacle, J72, of the first C-2742/VRC and the left receptacle, J71, of the second C-2742/VRC.

(6) When audio accessories are to be used, connect them to the MIKE receptacles as appropriate (fig. 3-16).

(7) Recheck to make sure all cable connectors are locked tightly on the associated receptacles of the equipment.

c. Removal. Observe the handling procedures prescribed in *a* above.

(1) Remove all front panel cable connections.

(2) Loosen the MT-1029/VRC clamps (fig. 1-14) and remove the receiver-transmitter from the MT-1029/VRC.

(3) If the receiver-transmitter is not to be replaced on the MT-1029/VRC, put the electrical

connector cover on the radio receptacle of the MT–1029/VRC (fig. 2–7) to protect it.

d. X-Mode Connections and Switch Position. The following operations apply when X-mode equipment (para 3–14*e*) is or is not used with the receiver-transmitters.

(1) When X-mode equipment is not used, check to see the X-MODE receptacle cover is locked on its receptacle. It contains jumper wires required for the operation of the radio when it is not connected to X-mode equipment. Check also to see that the X-MODE-NORMAL switch is set to NORMAL ((2)(*a*) below).

(2) When X-mode equipment is used, proceed as follows:

(*a*) Remove the bottom cover of the receiver-transmitter, raise assembly A4000, and set the X-MODE-NORMAL switch to X-MODE position (para 5–13*b;* fig. 5–12). Lock assembly A4000 back in position and replace the bottom cover on the receiver-transmitter.

(*b*) Connect the cable from the X-mode equipment to the X-MODE receptacle on the front panel of the receiver-transmitter.

(*c*) Mark or tag the receiver-transmitter to indicate it has been set for X-mode operation. Thus, if the unit is turned in or used without X-mode equipment connected to it ((1) above), the position of the switch is recorded.

(3) Also when the receiver-transmitter is replaced, check the position of the X-MODE-NORMAL switch on the replacement unit.

(4) No special wideband filters are required when the receiver-transmitter is used with X-mode equipment.

2–6. Installing and Removing R–442(*)/VRC

The procedures in *a, b,* and *c* below apply whether there is one (fig. 2–20) or two R–442(*)/VRC's (fig. 2–22).

a. Installation.

(1) Before installing the R–442(*)/VRC on the MT–1898/VRC, remove the electrical connector cover from the radio receptacle (fig. 2–8). Set the R–442(*)/VRC on the MT–1898/VRC and push it to the back of the MT–1898/VRC. Tighten the screw and clamp assembly (clamp) to lock the radio on the mount. To prevent the clamp from coming loose, tie a wire between the hole in the screw and the plate of one of the clamps.

(2) Connect the antenna cable, CG–1773/U, between the BNC antenna cable receptacle on the receiver antenna mast base and either ANT receptacle on the R–442(*)/VRC. In some installations, Adapter UG–306/U (fig. 2–5 or 2–6) is provided.

(3) When two R–442(*)/VRC's are used in the installation, connect Cable Assembly, Radio Frequency CG–1127/U between the ANT receptacles of the two R–442(*)/VRC's.

(4) When audio accessories are to be used (such as a headset or loudspeaker), connect them to the AUDIO receptacles of the R–442(*)/VRC.

b. Removal.

(1) Remove all front panel cable connections.

(2) Loosen the MT–1898/VRC clamps and remove the R–442(*)/VRC from the MT–1898/VRC.

(3) If the R–442(*)/VRC is not to be put back on the MT–1898/VRC, put the electrical connector cover on the radio receptacle of the MT–1898/VRC to protect it.

c. X-Mode Connections and Switch Position. The following operations apply when X-mode equipment (para 3–14*e*) is or is not used with the R–442(*)/VRC.

(1) When X-mode equipment is not used with the R–442(*)/VRC, check to see that the X-MODE-NORMAL switch is set to NORMAL position ((2)(*a*) below).

(2) When X-mode equipment is used with the R–442(*)/VRC, proceed as follows:

(*a*) Remove the bottom cover of the R–442(*)/VRC, raise assembly A4000, and set X-MODE-NORMAL switch to X-MODE position (para 5–13*b;* fig. 5–12). Lock assembly A4000 back in position and replace the bottom cover on the R–442(*)/VRC.

(*b*) Connect the X-mode equipment cable to MT–1898/VRC receptacle J12 (B, fig. 2–10; para 2–10*a*).

(*c*) Mark or tag the R–442(*)/VRC to indicate that it has been set for X-mode operation. Thus, if the unit is turned in or is used without X-mode equipment connected to it ((1) above), the position of the switch is recorded.

(*d*) Also when the R–442(*)/VRC is replaced, check the position of the X-MODE-NORMAL switch on the replacement R–442(*)/VRC.

(*e*) No special wideband filters are re-

quired when the R-442(*)/VRC is used with X-mode equipment, except those R-442(*)/VRC's that are specifically issued with Radio Terminal Set AN/GRC-163 (TM 11-5820-713-15). These R-442(*)/VRC's are identified with a plate that is attached to the top cover with the words "WIDEBAND FILTER INSTALLED".

2-7. Installing, Assembling, and Disassembling Antenna AS-1729/VRC

The AS-1729/VRC is the whip antenna used with the receiver-transmitters.

a. Installing MX-6707/VRC.

CAUTION

When tightening the MX-6707/VRC mounting screws, do not tighten them beyond a snug fit. Overtightening the screws may damage the plastic body of the MX-6707/VRC or it may damage the helix screw threads in the hull of some vehicles.

(1) Use the mounting hardware provided in the installation kit and install the MX-6707/VRC in its place in the vehicle. **Check to see that a ground strap is connected between the MX-6707/VRC and a ground point on the vehicle. Figure 2-3 shows the connection to a bracket.**

NOTE

It is advisable to apply graphite grease to the threads of the antenna sections to facilitate removal and also to help prevent the sections from seizing if they are infrequently separated from each other. See paragraph 5-3*b* for details.

(2) Check to see that the contact on the top of the MX-6707/VRC (A, fig. 2-1) protrudes fully from the top of the spring section. Use an Allen wrench to tighten the three setscrews to keep the contact in place.

(3) Connect the antenna cable, CG-1773/U between the ANT receptacle on the receiver-transmitter and the BNC antenna cable receptacle J1 on the MX-6707/VRC (fig. 2-20). In some installation, Adapter UG-306/U (fig. 2-5) is provided for one end of the CG-1773/U.

(4) Connect the control cable, CX-4722/VRC between the ANT CONT receptacle on the receiver-transmitter and the control cable receptacle J2 on the MX-6707/VRC (fig. 2-20).

(5) Where there is a prescribed route and tying facilities for the CG-1773/U and CX-4722/VRC, use them. When there is no prescribed route, it is recommended that the two cables be tied together at approximately two-foot intervals, tied to the vehicle at critical points, and routed from the receiver-transmitter through the bottom of the MT-1029/VRC to the MX-6707/VRC in such a manner that the cables are not endangered by the movement of equipment and personnel.

(6) When the bottom antenna section, AS-1730/VRC, is not installed on the MX-6707/VRC, it is recommended that a sturdy type of masking tape be put over the top contact of the MX-6707/VRC (fig. 2-1) to protect it.

b. Assembling Antenna Sections. Inspect the antenna sections for damaged and split fiberglass. Check the tip of the top section to see that the embedded wiring is not exposed. Replace antenna sections that exhibit these defects.

CAUTION

Make sure that the antenna tip cap is in place on the tip of the top antenna section. It is required in order to protect personnel from the sharp point. It also helps to prevent the tip of the antenna section from being worn down to the embedded wiring due to scraping overhead surfaces, such as garage ceiling and concrete bridges.

(1) Screw the top section fully into the bottom section. If experience shows that the two sections come loose, wrap a few turns of electrical insulation tape around the joint.

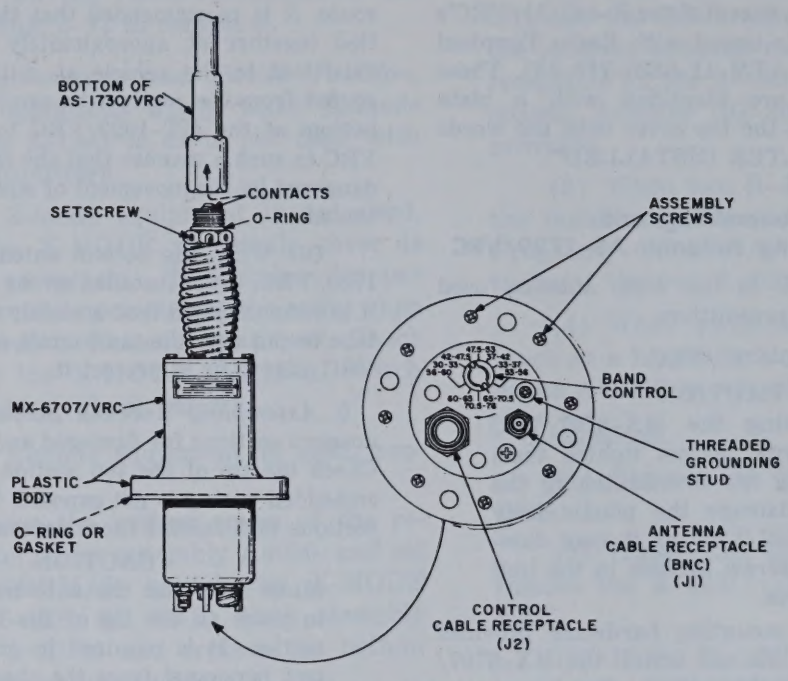
(2) Screw the bottom section into the top of the spring section of the MX-6707/VRC (A, fig. 2-1).

(3) Connect the safety wire between the holes in the bottom antenna section and the MX-6707/VRC (fig. 2-2). Tie the ends of the safety wire into a small pigtail and flatten the pigtail back against the top of the MX-6707/VRC.

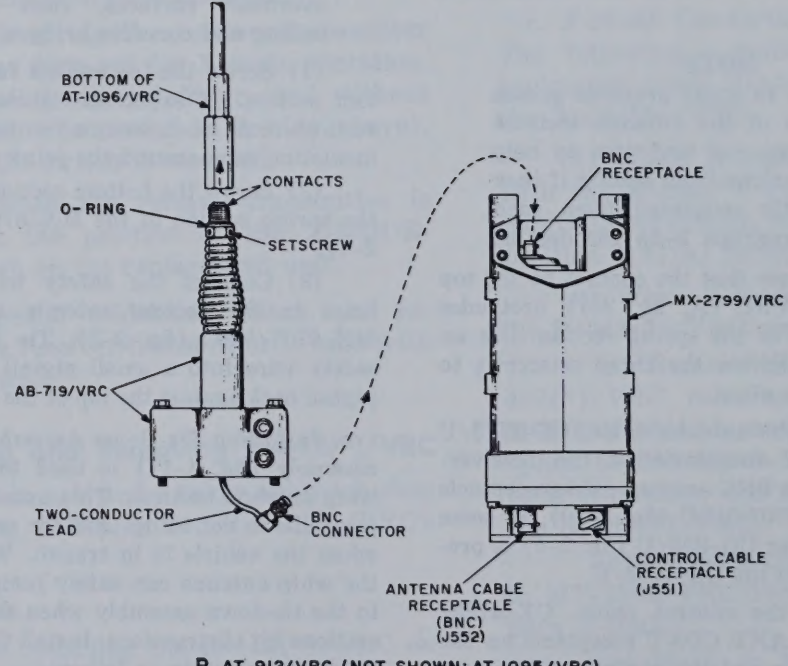
c. Installing Tie-Down Assembly. The tie-down assembly (fig. 1-11) is used to pull down the whip antenna sections. This usually is done when the radio is not being used for communication or when the vehicle is in transit. When tied down, the whip antenna can safely jump out of the clip in the tie-down assembly when the whip antenna sections hit obstructions. Install the whip antenna tie-down assembly as follows:

CAUTION

Do not use the hold-down clamp that is provided in some vehicles. It is not de-



A. AS-1729/VRC (NOT SHOWN: AT-1095/VRC).



B. AT-912/VRC (NOT SHOWN: AT-1095/VRC).

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Figure 2-1. Antennas AS-1729/VRC and AT-912/VRC, matching unit details.

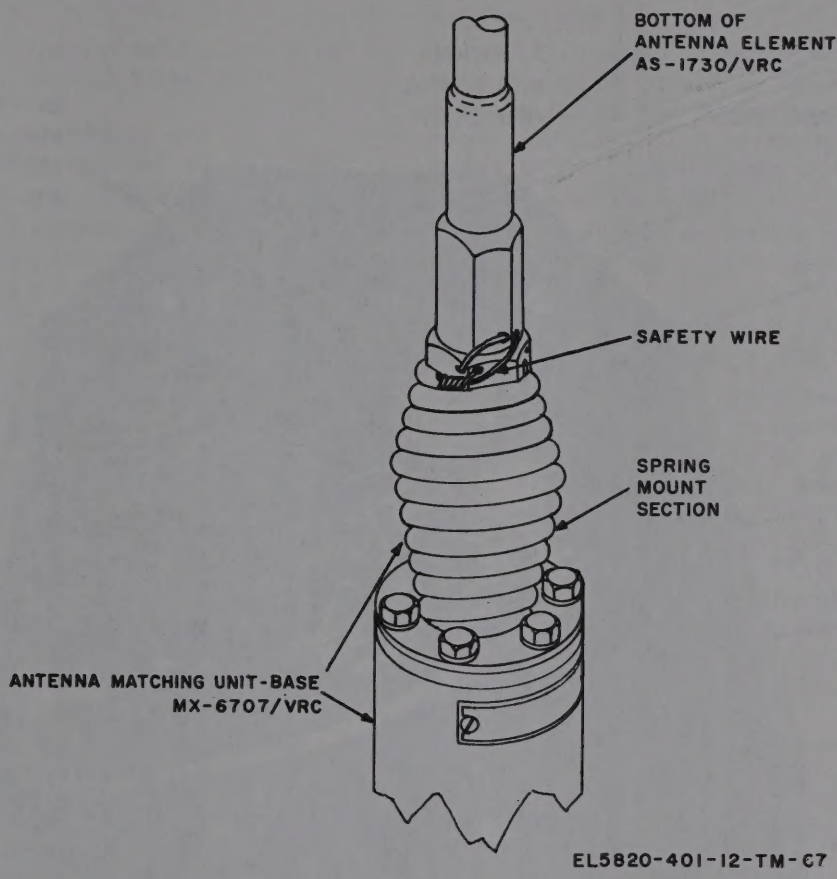


Figure 2-2. Tying safety wire between AS-1730/VRC and MX-6707/VRC of AS-1729/VRC.

signed to permit the whip antenna to jump out of the clip. It can also cut into the fiberglass and thus provide a grounding connection to the embedded wiring which could prevent radio communication.

(1) Slide the V-shaped locking jaws of the tie-down assembly to approximately the middle of the top antenna section. Do not put the antenna *beneath* the clamp; it cannot spring out in this position.

(2) Pull down the antenna sections to approximately 60 degrees above ground level or above the top section of the vehicle, and tie the cord to a convenient place on the vehicle. The angle should be such that personnel are not endangered by the point of the antenna.

(3) When there are two or more antennas on the vehicle, do not tie down the antennas in such a way that they cross each other.

(4) The antenna may be tied down when the radio is being used, provided communication can be established under this condition.

(5) If the cord unravels, cut off the raveled part and put the end over a flame a moment to seal the threads. Tie a knot in the end of the cord.

d. Disassembling Antenna Sections.

(1) Remove the tie-down assembly and unscrew the top antenna section from the bottom antenna section.

(2) To remove the bottom antenna section, remove the safety wire from the holes in the bottom antenna section (fig. 2-2) and unscrew the bottom section from the MX-6707/VRC. See in-

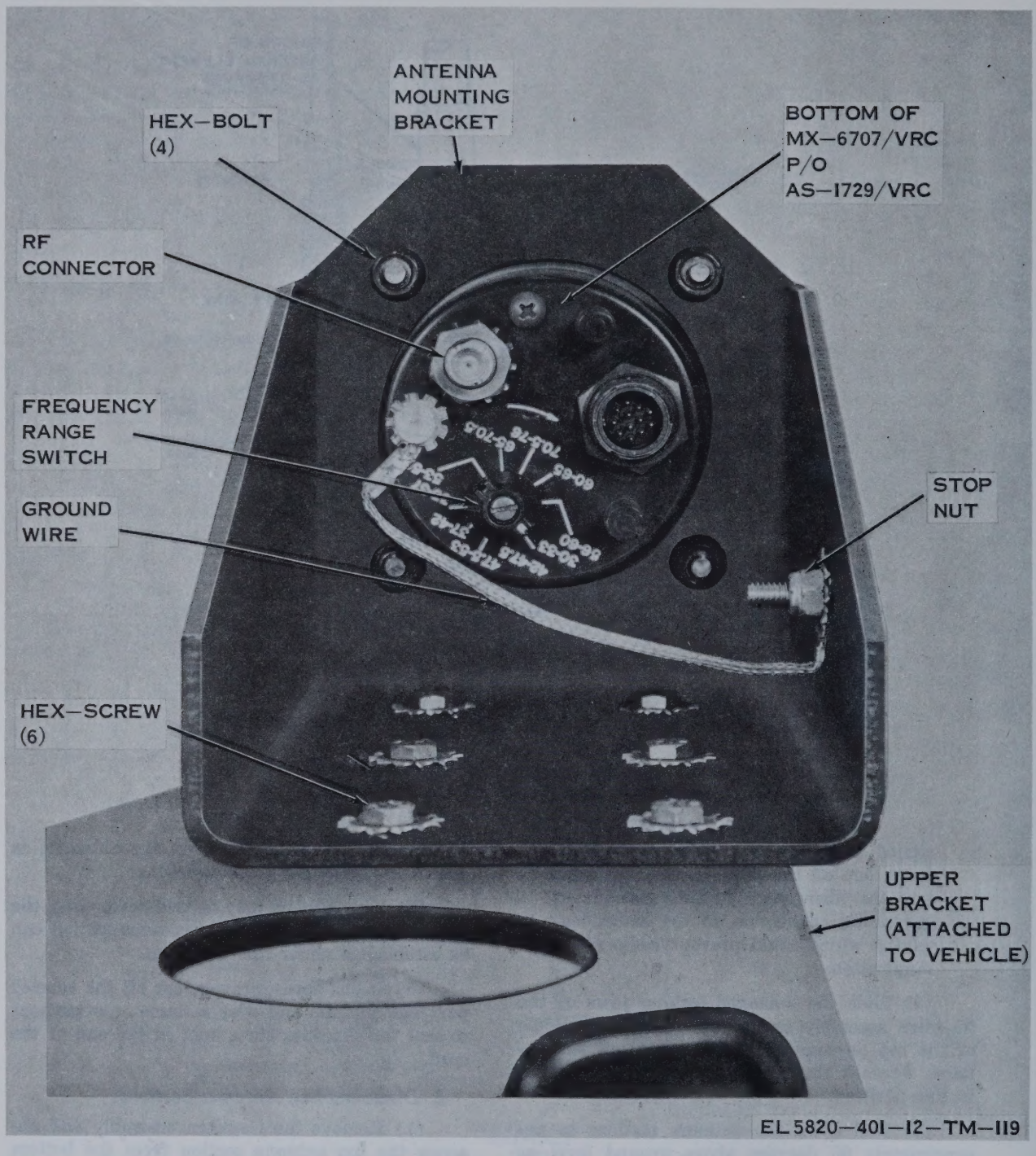


Figure 2-3. Details of MX-6707/VRC installed in bracket on vehicle.

structions in *a*(6) above. Leave the safety wire in the top of the MX-6707/VRC.

(3) Store the removed antenna sections and tie-down assembly in a safe place.

2-8. Installing, Assembling, and Disassembling Antenna AT-912/VRC

a. Installing MX-2799/VRC and AB-719/VRC.

(1) Using the mounting hardware provided, install the mounting clamp of the AB-719/VRC on the end of the MX-2799/VRC (A or B, fig. 1-12), with the unpainted end of the mounting clamp touching the MX-2799/VRC. Do not overtighten the four screws. To do so may damage the helix screw threads in the MX-2799/VRC.

(2) Insert the end of the AB-719/VRC spring section into the mounting clamp until the end of the spring section is level with the bottom of the mounting clamp. Hold it in this position and tighten the two bolts in the mounting clamp to grip the spring section.

(3) Lock the BNC connector of the two-conductor lead to the BNC receptacle on the MX-2799/VRC (B, fig. 2-1).

NOTE

It is advisable to apply graphite grease to the threads of the antenna sections to facilitate removal and also to prevent the sections from seizing if they are infrequently separated from each other. See paragraph 5-3*b* for details.

(4) Check to see that the contact on the top of the AB-719/VRC (B, fig. 2-1) protrudes fully from the top of the spring section. Use an Allen wrench to tighten the three setscrews to keep the contact in place.

(5) Connect the antenna cable, CG-1773/U, and control cable, CX-4722/VRC, between the radio and the MX-2799/VRC. In some installations, Adapter UG-306/U (fig. 2-5) is provided for one end of the CG-1773/U.

(6) Apply the instructions given in paragraph 2-7*a*(5) and (6) to the MX-2799/VRC.

b. Assembling Antenna Sections. Apply the instructions given in paragraph 2-7*b*(1) and (2) to assemble the AT-912/VRC antenna sections.

c. Installing Tie-Down Assembly. Apply the instructions given in paragraph 2-7*c* to install the tie-down assembly.

d. Disassembling Antenna Sections.

(1) Remove the tie-down assembly and unscrew the top antenna section from the bottom antenna section.

(2) Unscrews the bottom antenna section from the spring section of the AB-719/VRC. When the bottom antenna section is not installed on the AB-719/VRC, it is recommended that a sturdy type of masking tape be put over the top contact (B, fig. 2-1).

(3) Store the removed tie-down assembly and antenna sections in a safe place.

2-9. Installing and Removing Antenna System Used with R-442(*)/VRC

The antenna system for the R-442(*)/VRC installed in a vehicle includes the whip antenna sections MS-116A, MS-117A, and MS-118A (fig. 2-4), attached to a mast base, AB-15/GR (fig. 2-5), AB-558/GR (fig. 2-6), or equivalent, and the rf cable assembly, CG-1773/U, connected between the R-442(*)/VRC and the mast base. The complete receiver antenna system must be connected to enable the R-442(*)/VRC to function in the radio system.

a. General.

(1) The mast base is permanently installed in a mounting bracket attached to the vehicle or in a prescribed hole in the vehicle. The procedures in *d* below provide instructions for replacing the mast base.

(2) The antenna cable, CG-1773/U, is permanently attached to the mast base and the R-442(*)/VRC (*b* below).

(3) The assembled antenna sections normally are permanently installed in the mast base. The procedures in *c* below provide instructions for removing and installing the antenna sections.

b. Connecting R-442(*)/VRC to Antenna System.

(1) After the R-442(*)/VRC is installed in the MT-1898/VRC, connect the CG-1773/U between the BNC receptacle on the mast base and either ANT receptacle on the R-442(*)/VRC (fig. 2-20). In some installations, Adapter UG-306/U (fig. 2-5 or 2-6) is provided; use it when it is provided.

(2) When there is a prescribed route and tying facilities provided for the CG-1773/U, use them. When there is no prescribed route, it is recommended that the cable be tied to the vehicle at critical points and routed from the R-442(*)/

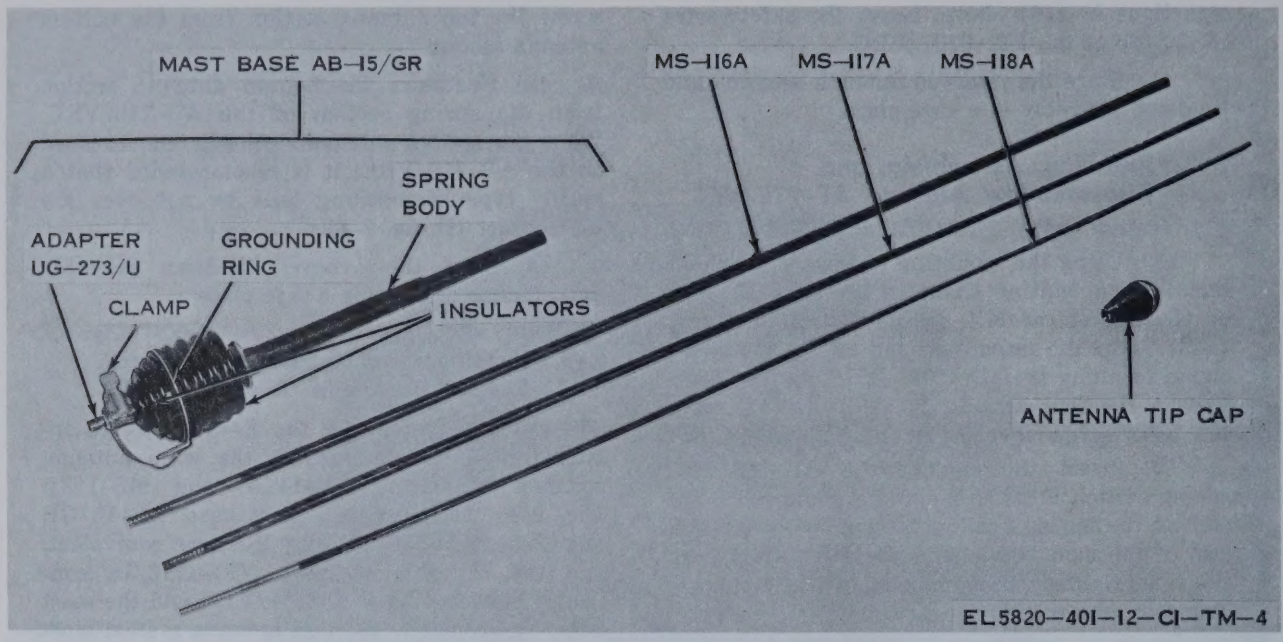


Figure 2-4. Mast Base AB-15/GR and Antenna Elements MS-116A, MS-117A, and MS118A.

VRC through the bottom of the MT-1898/VRC to the antenna mast base in such a manner that the cable is not endangered by movement of equipment and personnel.

c. Assembling and Disassembling Antenna Elements MS-116A, MS-117A, and MS-118A. It is advisable to apply graphite grease (para 5-3*a* and *b*) to each antenna element thread.

(1) *Assembling antenna elements.*

(*a*) If provided, remove and store the rubber cap provided for the top of the mast base (fig. 2-6). It is used again when the antenna sections are removed from the mast base.

(*b*) Screw the three antenna elements together. Screw the bottom antenna element into the base.

CAUTION

Make sure the antenna tip cap is in place on the top antenna element. It is required in order to protect personnel from being injured by the sharp point when the antenna is tied down.

(*c*) If desired, the antenna may be tied down when the R-442(*)/VRC is not being used for communication or when the vehicle is in transit. Tie one end of the cord to the junction of the top and middle antenna elements, pull the antenna down to approximately 60 degrees above ground level or the top of the vehicle, and tie the cord to a convenient place on the vehicle. The angle should be such that personnel will not be endangered by the point of the antenna.

(*d*) When there are two or more antennas on a vehicle, do not tie down the antennas in such a way that they cross each other.

(2) *Disassembling antenna elements.*

(*a*) Unscrew the three antenna elements from each other and the mast base. Clean and tie the elements together; store them in a safe place.

(*b*) If provided, put the rubber cap on the mast section receptacle (fig. 2-6). If no cap is available, put a sturdy piece of masking tape over the hole to keep out dirt and water.

d. Installing and Removing Mast Bases. Mast Base AB-15/GR (fig. 2-4 and 2-5) and Mast Base AB-558/GR (fig. 2-6) are used to hold up the R-442(*)/VRC antenna elements.

(1) *AB-15/GR* (fig. 2-4 and 2-5).

(*a*) *Installation.* Before installing the AB-15/GR in the vehicle mounting bracket, remove enough paint from around the bottom of the hole in the mounting surface to permit the grounding

ring to touch bare metal. Put a light coating of graphite grease (para 5-3*a*(1)) on the bare metal.

1. Separate the insulators from each other by holding the lower insulator and unscrewing the mast base body from the lower insulator.

2. Assemble the parts of the mast base in the hole in the mounting bracket as shown in figure 2-5. Carefully tighten the upper and lower insulators by holding the lower insulator and screwing the mast base body until the insulator sections are secured to the vehicle mounting surface.

3. If provided, discard the binding post assembly. Attach Adapter UG-273/U to the mast base receptacle. Tighten the grounding strap around the UG-273/U.

4. If provided, attach Adapter UG-306/U to the UG-273/U. Connect the antenna cable from the radio to the adapter.

5. Install the antenna elements when radio operation is required (*c*(1) above).

(*b*) *Removal.*

1. Remove the antenna elements (*c*(2) above) and disconnect the antenna cable from the UG-273/U or UG-306/U.

2. Separate the insulators by holding the lower insulator and unscrewing the mast base body until the two sections are separated.

3. Remove the grounding ring and rubber washer from the hole in the mounting bracket.

4. Reassemble the mast base (fig. 2-4 and 2-5). The UG-306/U may be kept with the mast base or the antenna cable.

(2) *AB-558/GR* (fig. 2-6).

(*a*) *Installation.*

1. When there are nuts for the mounting bolts, remove the paint from the vehicle at the point where the nut will be positioned to hold the grounding ring.

2. Insert the insulator section into the hole provided in the vehicle and attach the insulator section to the vehicle with the mounting bolts. Do not overtighten; the helix threads in the vehicle may be damaged.

3. Attach Adapter UG-273/U to the receptacle at the bottom of the mast base.

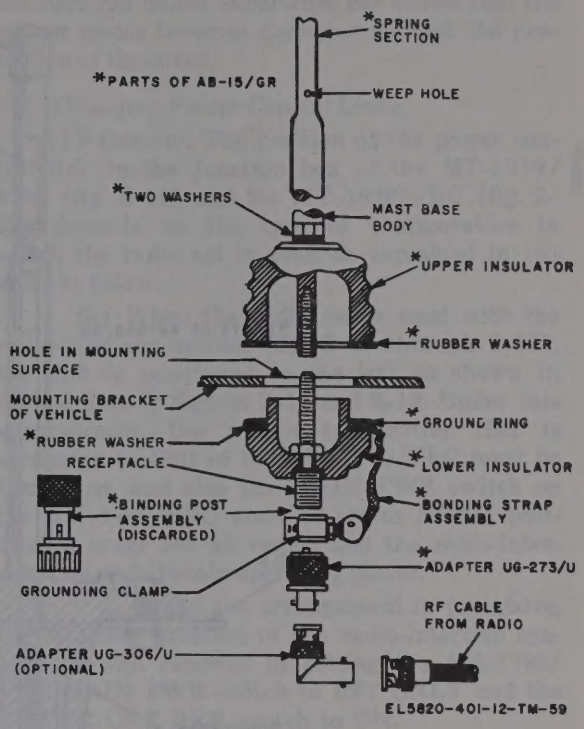


Figure 2-5. Mast Base AB-15/GR, assembly view; and Adapter UG-306/U.

Tighten the grounding clamp around the UG-273/U.

4. If provided, attach Adapter UG-306/U to the UG-273/U. Connect the antenna cable from the radio to the adapter.

5. Attach the antenna elements when radio operation is required (*c*(1) above).

(*b*) *Removal.*

1. Remove the antenna element (*c*(2) above) and disconnect the antenna cable from the UG-273/U or UG-306/U.

2. Remove the mounting bolts and take the insulator section out of the vehicle. Replace the mounting bolts in the vehicle.

3. The UG-306/U may be kept with the mast base or the antenna cable.

2-10. MT-1029/VRC and MT-1898/VRC; General Disassembly Procedures; Installing Cables and Changing Power Control Links

Mounting MT-1029/VRC (fig. 2-7) and Mounting MT-1898/VRC (fig. 2-8) (radio mounts) are used for mounting radios in vehicles. The junc-

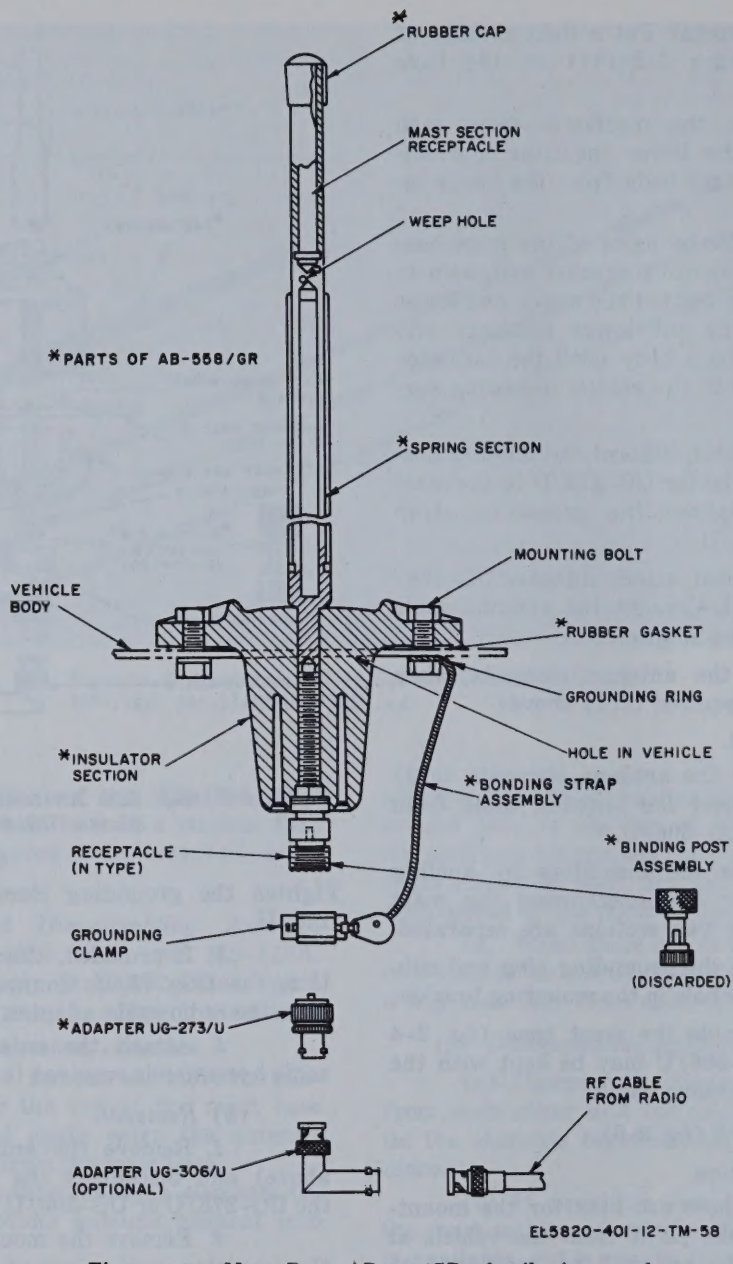


Figure 2-6. Mast Base AB-558/GR, detail view; and Adapter UG-306/U.

tion box in each radio mount is provided with receptacles for passage of dc power and audio signals to and from the radios installed in the mounts.

a. General Disassembly Procedures.

(1) To remove or install cables on the radio mounts, use the procedures in (3) through (5) below.

(2) To remove the radio mounts from the vehicle, remove the top tray (3) below), then the base assembly mounting screws. To install mounts, reverse the procedure.

Caution

In some vehicles, reinforcing plates are provided under the frame with the mounting screw nuts.

(3) To separate the top tray from the base assembly, remove the connections of the ground-

ing straps to the top tray and remove the hex head screws and washers. To replace the tray on the base assembly, reverse the procedure.

(4) Attach the required cables to the receptacles (fig. 2–9 or 2–10). If the cable connectors are not at the approximate angle shown, loosen the receptacle locknut with the spanner wrench, and twist the receptacle to the proper angle (using the cable connector as a lever). Check to see that all receptacle locknuts are tight.

(5) Before replacing the top tray, route the cables in the direction of the next cable connection. Also check to see that the isolator assemblies are properly positioned so that the flat side will mate with the isolator assembly brackets in the top tray (A, fig. 2–9 or 2–10).

(6) Before placing the radio in the mount, clean out the top tray drain holes located around each mounting screw and at the back wall.

(7) On early productions of the MT–1029/VRC, a circular hole was provided instead of the current louvered opening for the blower motor of the receiver-transmitter. For such open vehicles as M151 and M715, obtain a vent cover and install it in accordance with instructions in SB 11–586. In closed vehicles, such as tanks and armored personnel carriers, the cover normally is not required unless experience has shown that the blower motor becomes damaged without the protection of the cover.

b. Changing Power Control Links.

(1) *General.* The position of the power control link in the junction box of the MT–1029/VRC (fig. 2–11) and the MT–1898/VRC (fig. 2–12) depends on the type of configuration in which the radio set is used, as explained in (*a*) and (*b*) below.

(*a*) When the radio set is used with the radio-intercom system (fig. 2–28 through 2–35), the link is positioned to the left as shown in dashed lines in figures 2–11 and 2–12. Under this arrangement, the receiver-transmitter that is connected to J501 of the AM–1780/VRC must be turned on, and also the MAIN PWR switch on the AM–1780/VRC must be set to NORM position in order for all radios and the radio-intercom system to obtain operating power.

1. Under the arrangement in (*a*) above, the intercom function of the radio-intercom system can still function by setting the AM–1780/VRC MAIN PWR switch to INT ONLY and the POWER CKT BKR switch to ON.

2. It may be operationally desirable, when one or two R–442(*)/VRC are in the sys-

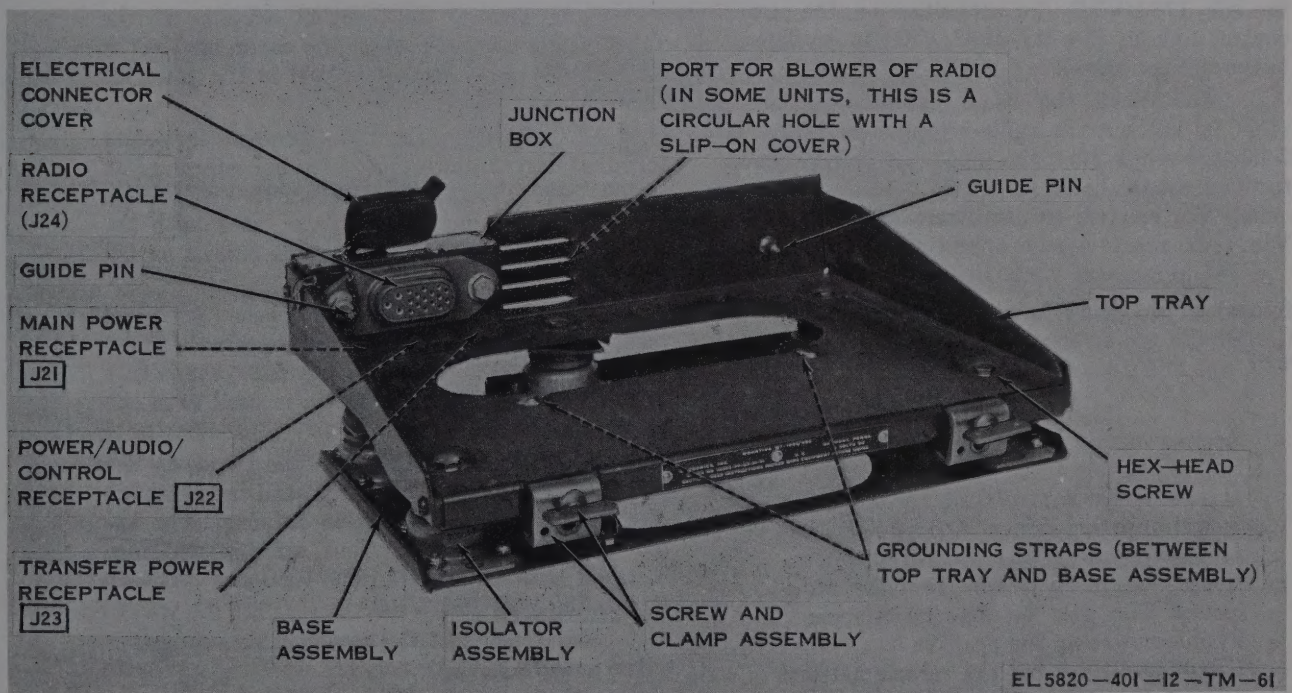


Figure 2–7. Mounting MT–1029/VRC, parts identification.

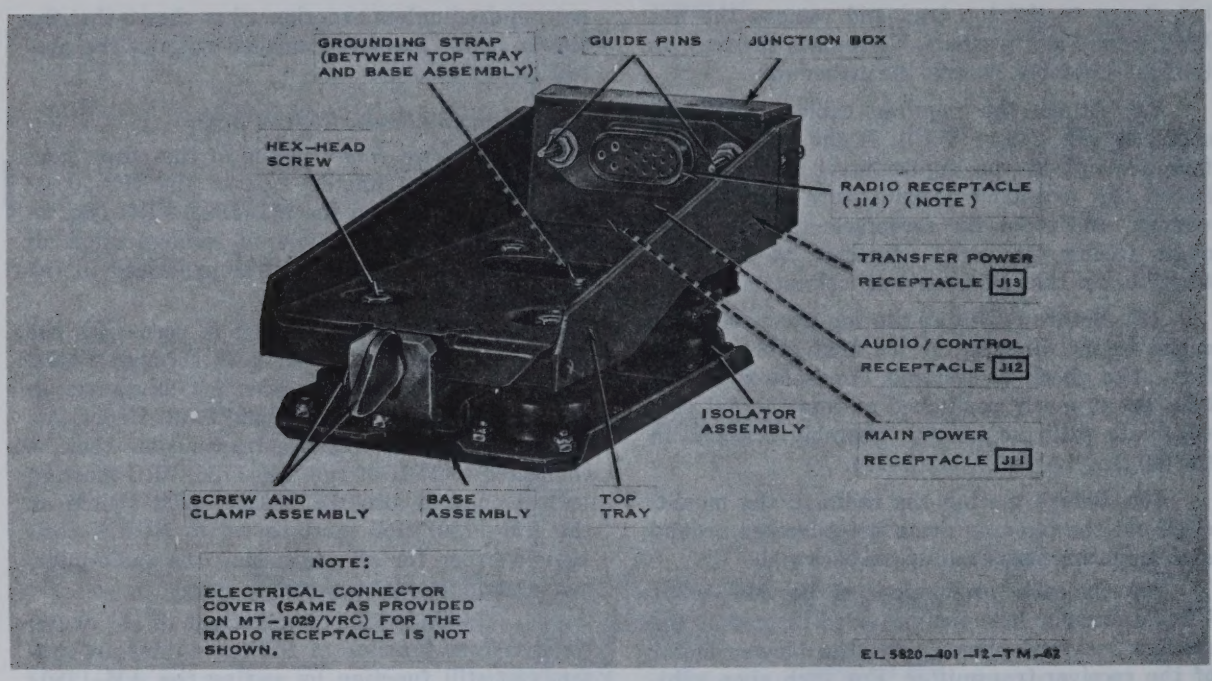


Figure 2-8. Mounting MT-1898/VRC, parts identification.

tem, to be able to turn on the R-442(*)VRC's without turning on the receiver-transmitter and the AM-1780/VRC. For this situation, the power control link in the MT-1898/VRC is positioned to the right as shown in figure 2-12.

(*b*) When the radio set is used alone (that is, without the radio-intercom system (fig. 2-20 through 2-27)), the link *must be* positioned to the right to shown in figures 2-11 and 2-12 to enable the receiver-transmittters and R-442(*)/VRC to be able to receive operating power.

(2) *Procedure* (fig. 2-11 and 2-12). The following procedure is used to change the position of the power control links in the MT-1029/VRC and MT-1898/VRC junction boxes.

WARNING

Approximately 22 to 30 volts dc, from the vehicle electrical system, is present at the power control link in the radio mount junction boxes. Accordingly, before performing the following operations, remove dc power from the radio mount. This may be done by temporarily disconnecting the positive lead of the CX-4720/VRC from the vehicle battery (fig. 2-15), or by detaching the CX-4720/VRC Bendix connector from the vehicle power outlet or from the MX-7778/GRC.

(*a*) Loosen the captive screws of the junction box cover, pry off the cover, and set it aside. The rubber gasket is held to the cover by the captive screws.

(*b*) Position the link between the pivot terminal screw and *right* terminal screw (E24 in MT-1029/VRC; E14 in MT-1898/VRC) when the radio-intercom system is not used with the radio ((1)(*b*) above). Tighten the screws on the link.

(*c*) Position the link between the pivot terminal screw and the *left* terminal screw (E22 in MT-1029/VRC; E12 in MT-1898/VRC) when the radio-intercom system is used with the radio ((1)(*a*) above).

(*d*) Replace and secure the cover on the junction box. Be careful not to bend the extended terminal to which the fuse is attached. The extended terminals of the fuse are inserted into E21 and E24 on the MT-1029/VRC and E11 and E14 on the MT-1898/VRC.

(*e*) Reconnect the power cable connection to the power source.

c. Procedure for Determining Position of Power Control Link in Radio Mounts. The follow-

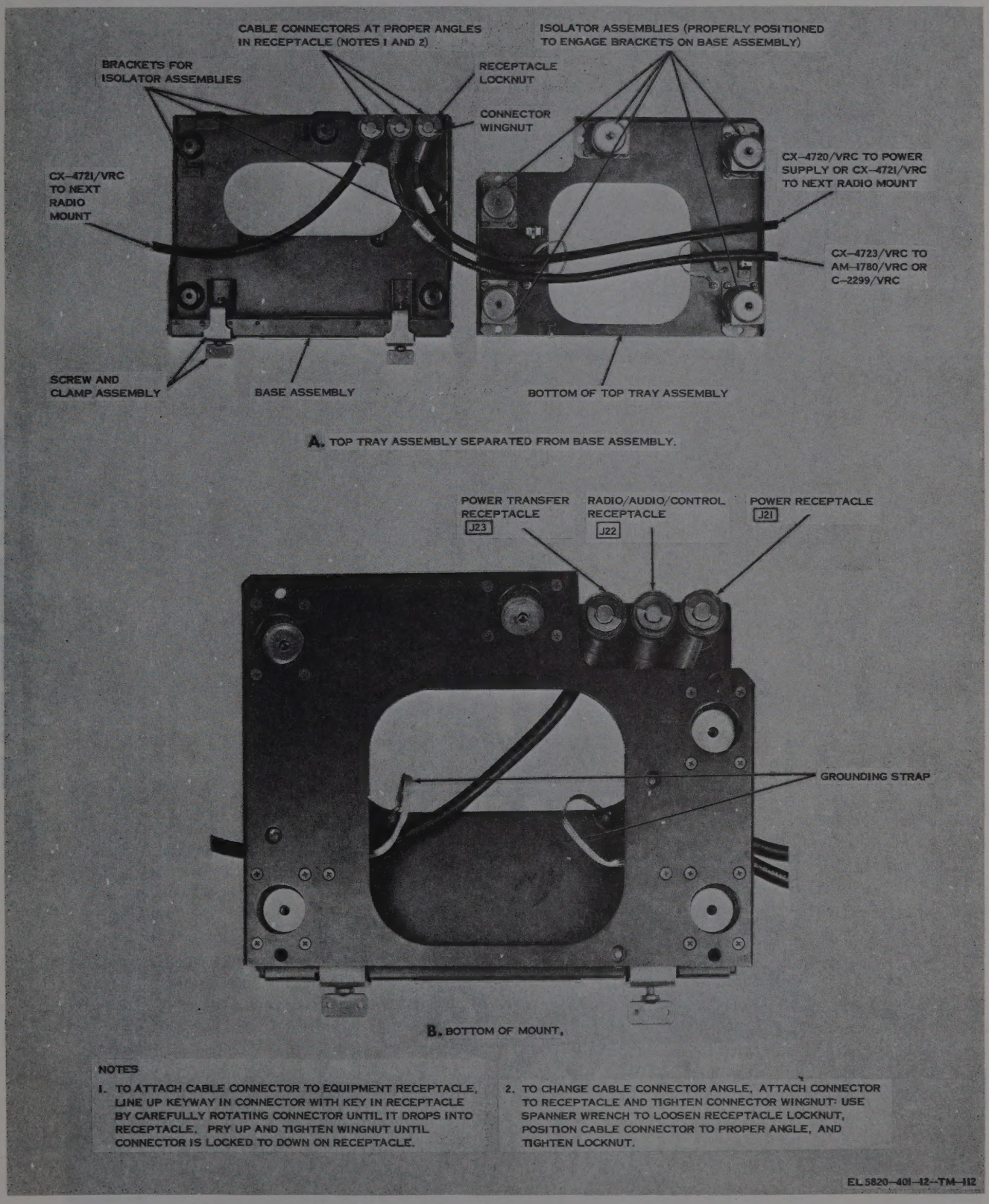

CABLE CONNECTORS AT PROPER ANGLES IN RECEPTACLE (NOTES 1 AND 2)
ISOLATOR ASSEMBLIES (PROPERLY POSITIONED TO ENGAGE BRACKETS ON BASE ASSEMBLY)
BRACKETS FOR ISOLATOR ASSEMBLIES
RECEPTACLE LOCKNUT
CONNECTOR WINGNUT
CX-4721/VRC TO NEXT RADIO MOUNT
CX-4720/VRC TO POWER SUPPLY OR CX-4721/VRC TO NEXT RADIO MOUNT
CX-4723/VRC TO AM-1780/VRC OR C-2299/VRC
SCREW AND CLAMP ASSEMBLY
BASE ASSEMBLY
BOTTOM OF TOP TRAY ASSEMBLY
A. TOP TRAY ASSEMBLY SEPARATED FROM BASE ASSEMBLY.
POWER TRANSFER RECEPTACLE J23
RADIO/AUDIO/CONTROL RECEPTACLE J22
POWER RECEPTACLE J21
GROUNDING STRAP
B. BOTTOM OF MOUNT.
NOTES
1. TO ATTACH CABLE CONNECTOR TO EQUIPMENT RECEPTACLE, LINE UP KEYWAY IN CONNECTOR WITH KEY IN RECEPTACLE BY CAREFULLY ROTATING CONNECTOR UNTIL IT DROPS INTO RECEPTACLE. PRY UP AND TIGHTEN WINGNUT UNTIL CONNECTOR IS LOCKED TO DOWN ON RECEPTACLE.
2. TO CHANGE CABLE CONNECTOR ANGLE, ATTACH CONNECTOR TO RECEPTACLE AND TIGHTEN CONNECTOR WINGNUT: USE SPANNER WRENCH TO LOOSEN RECEPTACLE LOCKNUT, POSITION CABLE CONNECTOR TO PROPER ANGLE, AND TIGHTEN LOCKNUT.
EL 5820-401-12--TM-112

Figure 2-9. Mounting MT-1029/VRC, disassembled and with typical cables attached to receptacles.

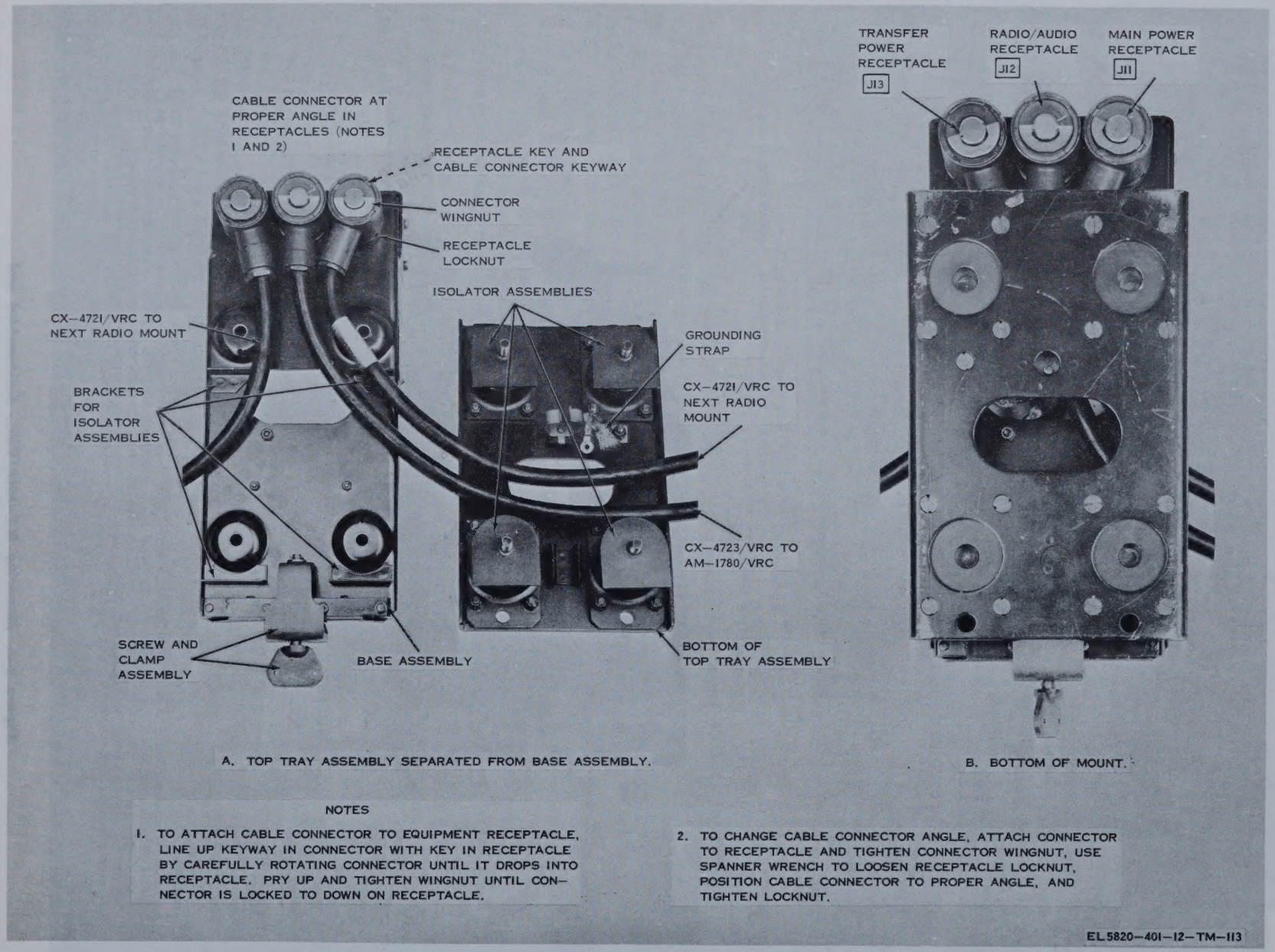

CABLE CONNECTOR AT PROPER ANGLE IN RECEPTACLES (NOTES 1 AND 2)
RECEPTACLE KEY AND CABLE CONNECTOR KEYWAY
CONNECTOR WINGNUT
RECEPTACLE LOCKNUT
ISOLATOR ASSEMBLIES
CX-4721/VRC TO NEXT RADIO MOUNT
GROUNDING STRAP
BRACKETS FOR ISOLATOR ASSEMBLIES
CX-4721/VRC TO NEXT RADIO MOUNT
CX-4723/VRC TO AM-1780/VRC
SCREW AND CLAMP ASSEMBLY
BASE ASSEMBLY
BOTTOM OF TOP TRAY ASSEMBLY
TRANSFER POWER RECEPTACLE J13
RADIO/AUDIO RECEPTACLE J12
MAIN POWER RECEPTACLE J11
A. TOP TRAY ASSEMBLY SEPARATED FROM BASE ASSEMBLY.
B. BOTTOM OF MOUNT.
NOTES
1. TO ATTACH CABLE CONNECTOR TO EQUIPMENT RECEPTACLE, LINE UP KEYWAY IN CONNECTOR WITH KEY IN RECEPTACLE BY CAREFULLY ROTATING CONNECTOR UNTIL IT DROPS INTO RECEPTACLE. PRY UP AND TIGHTEN WINGNUT UNTIL CONNECTOR IS LOCKED TO DOWN ON RECEPTACLE.
2. TO CHANGE CABLE CONNECTOR ANGLE, ATTACH CONNECTOR TO RECEPTACLE AND TIGHTEN CONNECTOR WINGNUT, USE SPANNER WRENCH TO LOOSEN RECEPTACLE LOCKNUT, POSITION CABLE CONNECTOR TO PROPER ANGLE, AND TIGHTEN LOCKNUT.
EL5820-401-12-TM-113

Figure 2-10. Mounting MT-1898/VRC, disassembled and with typical cables attached to receptacles.

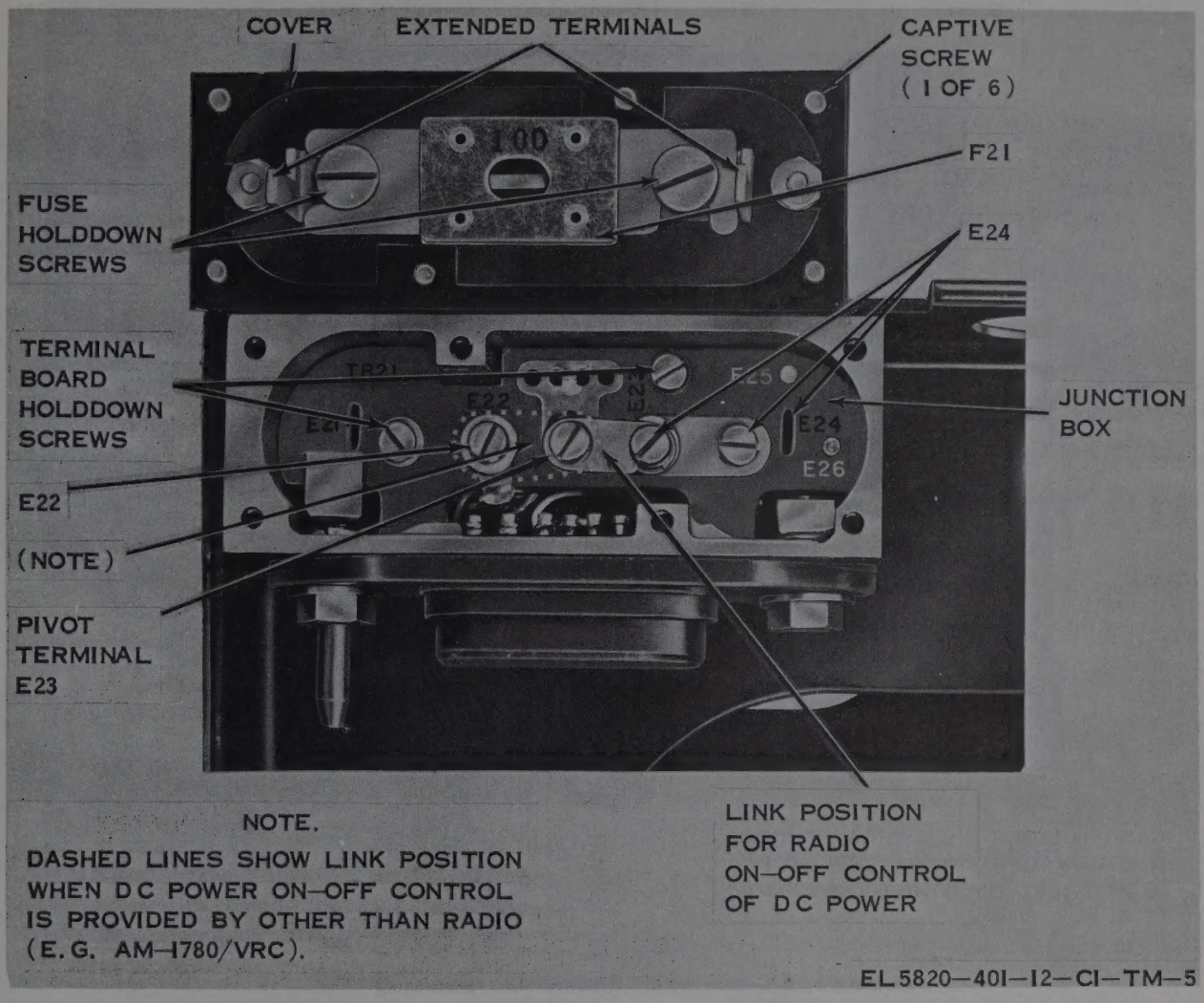


Figure 2-11. Junction box of MT-1029/VRC, positioning of power control link.

ing procedures may be used to determine to which position the power control link in the radio mount is set. The test is usually performed after a radio mount has been replaced by another one.

(1) *Radio not connected to radio-intercom system.* When the radio LIGHT switch is set to ON and the radio is turned on, the dial lamp should light. When this symptom is not obtained, the link position must be changed (*b*(2) (*b*) above).

(2) *Radio connected to radio-intercom system.* Under this situation, the AM-1780/VRC should be the master control of power for the radio and radio-intercom system. Perform the operations in sequence given.

(*a*) On the AM-1780/VRC, set the MAIN PWR and POWER CKT BKR switches to OFF.

(*b*) On the AM-1780/VRC, set the INSTALLATION switch to OTHER.

(*c*) Turn off all radios, and set the LIGHT switches to ON.

(*d*) Turn on each radio, in turn. If the dial light lights, the position of the link in the radio mount should be changed (*b*(2) (*d*) above.

(*e*) Set the AM-1780/VRC MAIN PWR sw. to NORM. The dial lamp in all radios should now light.

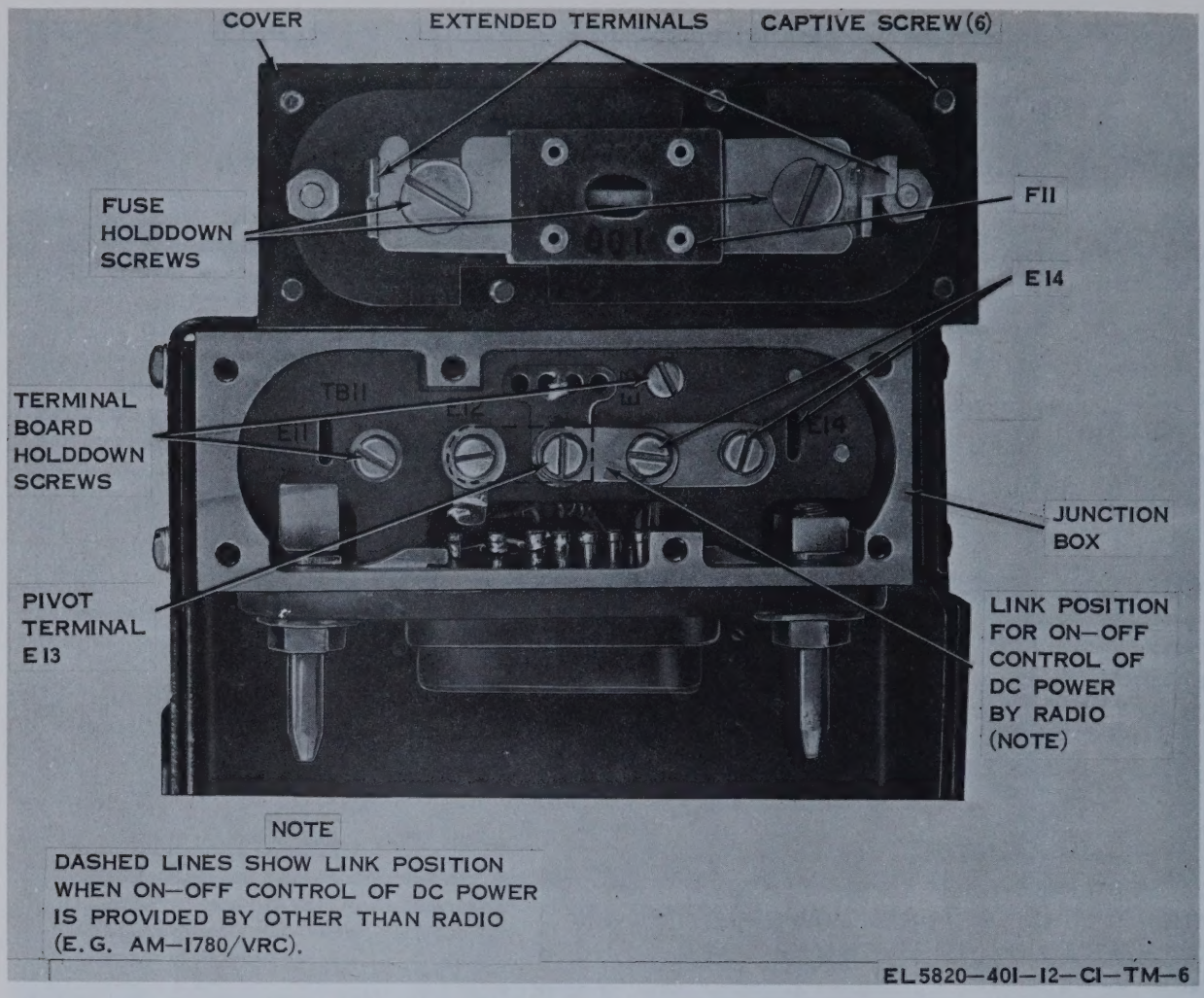


Figure 2-12. Junction box of MT-1898/VRC, positioning of power control link.

(*f*) When there is a second receiver-transmitter (connected to J503 of the AM-1780/VRC (fig. 2-31 and 2-35), it may be turned off without turning off the other receiver-transmitter and AM-1780/VRC. Similarily, when there are R-442(*)/VRC's, each may be turned off without turning off the receiver-transmitter and the AM-1780/VRC.

2-11. Installing and Removing CX-4720/VRC and CX-4721/VRC

Cable Assembly, Power, Electrical CX-4720/VRC (B, fig. 2-13) provides connection between the dc power source and the MT-1029/VRC in which receiver-transmitter is installed. Cable Assembly, Power, Electrical CX-4721/VRC (A, fig. 2-13) provides connection between radio mounts (MT-1029/VRC and MT-1898/VRC) to transfer power from one radio mount to the other. Both cable assemblies contain heavy-gage wire conductors.

a. Attaching Terminal Lugs and Bendix Connector to CX-4720/VRC.

(1) *Terminal lugs.* In installations in which the power cable is connected directly to the vehicle battery, terminal lugs are soldered to the cable conductors. The lugs are issued with the CX-4720/VRC and MT-1029/VRC.

CAUTION

In the order to identify the CX-4720/VRC wire pairs, attach a label perma-

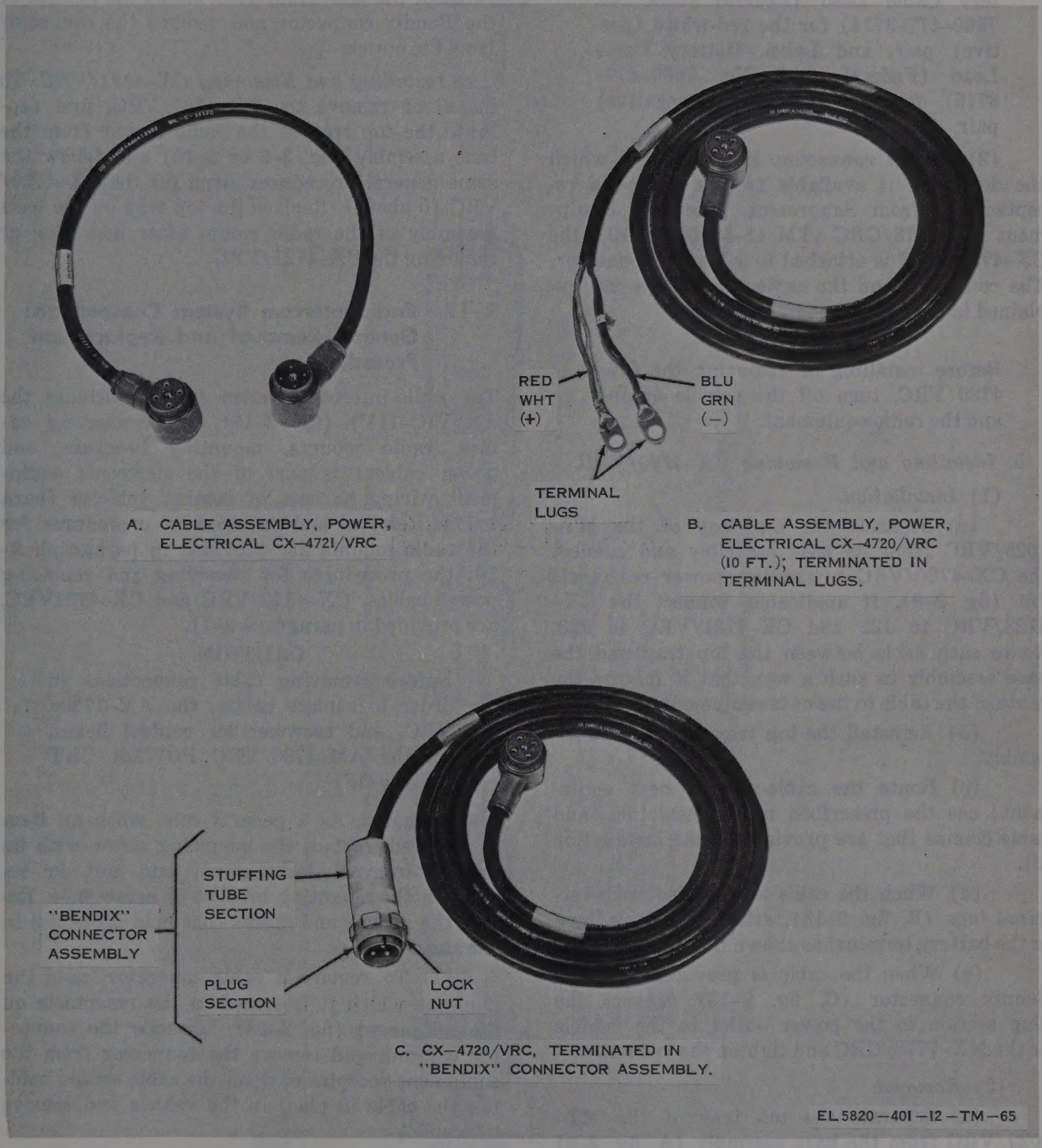


Figure 2-13. Cable Assemblies, Power, Electrical CX-4721/VRC and CX-4720/VRC.

nently to each pair of wires connected to the battery terminals (fig. 2–15). Following labels may be used: Label, Battery Cable Lead (Federal stock No. 7960–477–3714) for the red-white (postive) pair, and Label, Battery Cable Lead (Federal stock No. 7960–477–3715) for the blue-green (negative) pair.

(2) *Bendix connector.* In vehicles in which the dc power is available from a three-pin receptacle or from Suppressor, Electrical Equipment MX–7778/GRC (TM 11–5915–223–12), the CX–4720/VRC is attached to a Bendix connector. The connector and the cable connections are explained in figure 2–14.

CAUTION

Before installing or removing the CX–4720/VRC, turn off the vehicle engine and the radio equipment.

b. Installing and Removing CX–4720/VRC.

(1) *Installation.*

(*a*) Separate the top tray of the MT–1029/VRC from its base assembly and connect the CX–4720/VRC to the left power receptacle J21 (fig. 2–9). If applicable, connect the CX–4723/VRC to J22 and CX–4721/VRC to J23. Route each cable between the top tray and the base assembly in such a way that it follows the route of the cable to the next equipment.

(*b*) Reinstall the top tray on the base assembly.

(*c*) Route the cable to the next equipment; use the prescribed route, insulators, and cable clamps that are provided in the installation kit.

(*d*) When the cable is provided with terminal lugs (B, fig. 2–13), attach the cable lugs to the battery terminal as shown in figure 2–15.

(*e*) When the cable is provided with the Bendix connector (C, fig. 2–13) connect the plug section to the power outlet in the vehicle or the MX–7778/GRC and tighten the locknut.

(2) *Removal.*

(*a*) Separate the top tray of the MT–1029/VRC from the base assembly (A, fig. 2–9) and disconnect the CX–4720/VRC from its receptacle. If required, disconnect other cables from the radio mount. Replace the top tray on the base assembly.

(*b*) Disconnect the other end of the CX–4720/VRC from the battery terminals (fig. 2–15); be sure to tighten the nuts on the battery cable clamps after removal of the CX–4720/VRC. If the cable is connected to the vehicle power outlet or the MX–7778/GRC, loosen the locknut of the Bendix connector and remove the connector from the outlet.

c. Installing and Removing CX–4721/VRC. To install or remove the CX–4721/VRC, first separate the top tray of the radio mount from the base assembly (fig. 2–9 or 2–10) and follow the same general procedures given for the CX–4720/VRC (*b* above). Replace the top tray on the base assembly of the radio mount after installing or removing the CX–4721/VRC.

2–12. Radio-Intercom System Components: General Removal and Replacement Procedures

The radio-intercom system (which includes the AN/VIC–1(V) (fig. 2–16), interconnecting cables, radio mounts, mounting brackets, and power cables) is part of the electronic equipment wiring harness of combat vehicles (para 1–11). Removal and replacement procedures for the radio mounts are provided in paragraph 2–10; the procedures for removing and replacing power cables, CX–4720/VRC and CX–4721VRC, are provided in paragraph 2–11.

CAUTION

Before removing cable connections in order to replace cables, the AM–1780/VRC, and crewmember control boxes, set the AM–1780/VRC POWER CKT BKR to OFF.

a. Removal. As a general rule, when an item is removed, replace the mounting screw with its external-internal lockwashers and nut in its place in the mounting bracket or screw hole. Retain the screws and straps that hold up cables in the same way.

(1) To remove a cable connector, note the angle at which it is seated in the receptacle on the equipment (fig. 2–18). Unscrew the connector wingnut and remove the connector from the equipment receptacle. Open the cable straps holding the cable in place in the vehicle and remove the cable.

(2) To remove equipment, loosen the equipment mounting screws and remove the equipment from its mounting.

b. Replacement.

(1) Attach the equipment to its assigned mounting bracket; use the prescribed mounting

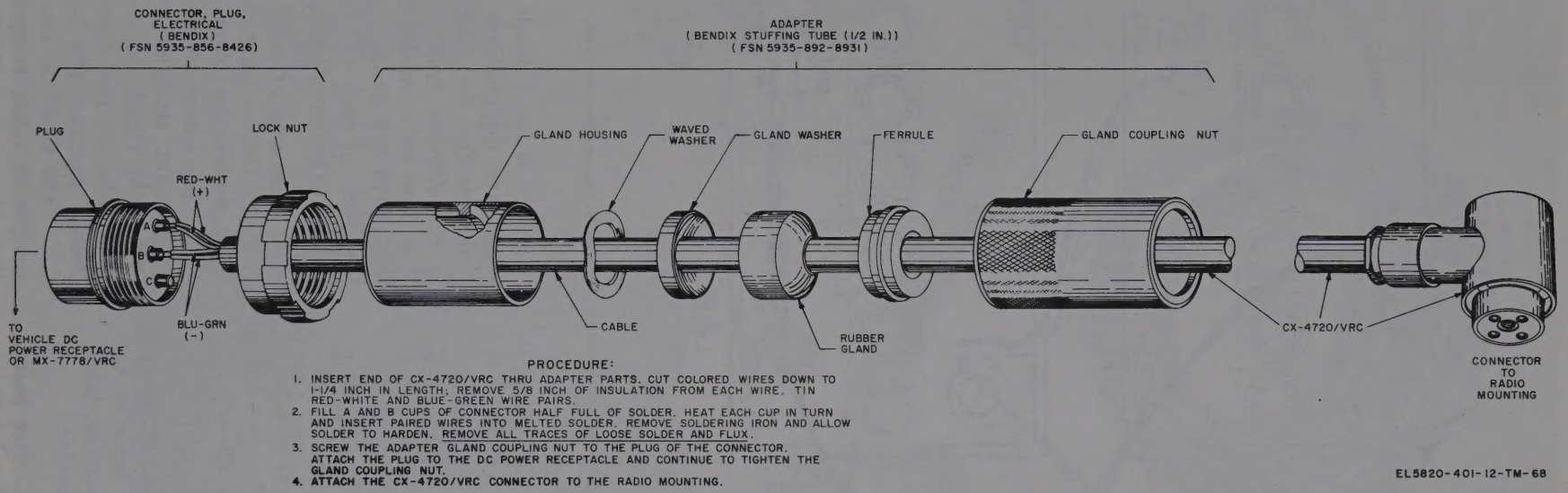

CONNECTOR, PLUG, ELECTRICAL (BENDIX) (FSN 5935-856-8426)
ADAPTER (BENDIX STUFFING TUBE (1/2 IN.)) (FSN 5935-892-8931)
PLUG
LOCK NUT
RED-WHT (+)
GLAND HOUSING
WAVED WASHER
GLAND WASHER
FERRULE
GLAND COUPLING NUT
A
B
C
TO VEHICLE DC POWER RECEPTACLE OR MX-7778/VRC
BLU-GRN (-)
CABLE
RUBBER GLAND
CX-4720/VRC
CONNECTOR TO RADIO MOUNTING
PROCEDURE:
1. INSERT END OF CX-4720/VRC THRU ADAPTER PARTS. CUT COLORED WIRES DOWN TO 1-1/4 INCH IN LENGTH. REMOVE 5/8 INCH OF INSULATION FROM EACH WIRE. TIN RED-WHITE AND BLUE-GREEN WIRE PAIRS.
2. FILL A AND B CUPS OF CONNECTOR HALF FULL OF SOLDER. HEAT EACH CUP IN TURN AND INSERT PAIRED WIRES INTO MELTED SOLDER. REMOVE SOLDERING IRON AND ALLOW SOLDER TO HARDEN. REMOVE ALL TRACES OF LOOSE SOLDER AND FLUX.
3. SCREW THE ADAPTER GLAND COUPLING NUT TO THE PLUG OF THE CONNECTOR. ATTACH THE PLUG TO THE DC POWER RECEPTACLE AND CONTINUE TO TIGHTEN THE GLAND COUPLING NUT.
4. ATTACH THE CX-4720/VRC CONNECTOR TO THE RADIO MOUNTING.
EL5820-401-12-TM-68

Figure 2-14. Bendix connector and CX-4720/VRC, assembly instructions.

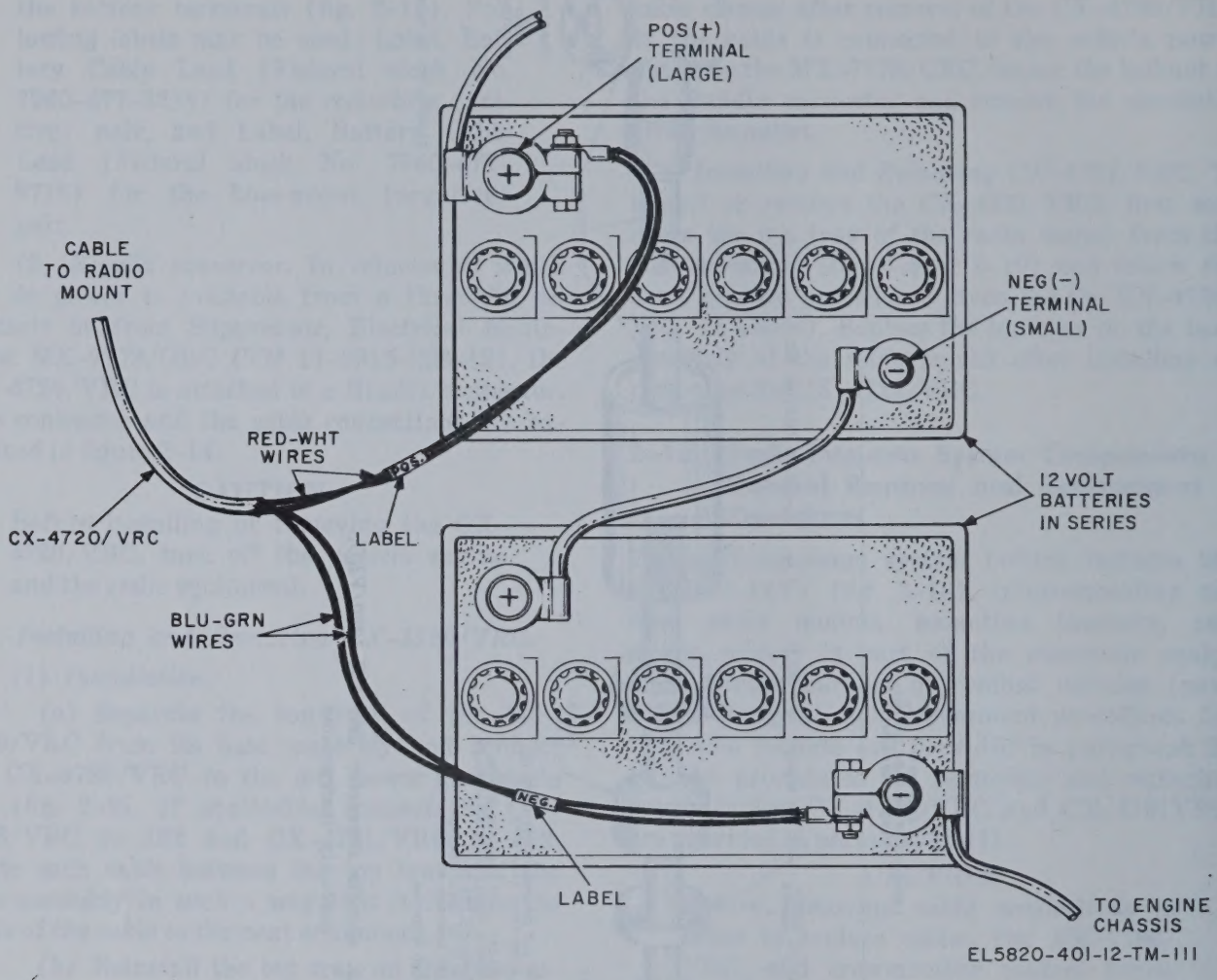


Figure 2–15. Connecting CX–4720/VRC to vehicle battery.

screws, washers, and nuts. Make sure an external-internal lockwasher is under the head of the screw and another under the nut.

(2) Attach the cable connector to the equipment receptacle (para 2–13*b*).

2–13. General Cabling Instructions

Refer to paragraph 2–11 for general discussion concerning the equipment required to enable the AN/VRC–12 series radios to be operational.

a. Identifying Cable Connectors. To identify the cable connectors with the equipment receptacle to which they are attached, inscribe the equipment reference designation on a tag, label, or decal and attach it to the cable connector.

(1) To label the CX–4720/VRC wire pairs, refer to paragraph 2–11*a* (fig. 2–15) for details.

(2) A set of decals containing the equipment receptacle designations (J501, J509, J71, etc) is available for the cables used in the radio and radio-intercom systems (fig. 2–17). The set is identified as a marking set under Federal stock No. 5975–918–8164. Attach the proper label to the neck of each cable connector while it is attached to the equipment receptacle.

b. Connecting Cables.

(1) Before connecting a cable to a receptacle, observe the following:

(*a*) Check to see that the connector pins are straight; straighten them if necessary.

(*b*) Check to see that the locknuts on both sides of the connector are tight; tighten them if necessary (fig. 2–19).

(*c*) Check to see that the locknuts on the equipment cable receptacles are tight; tighten them if necessary (fig. 2–18).

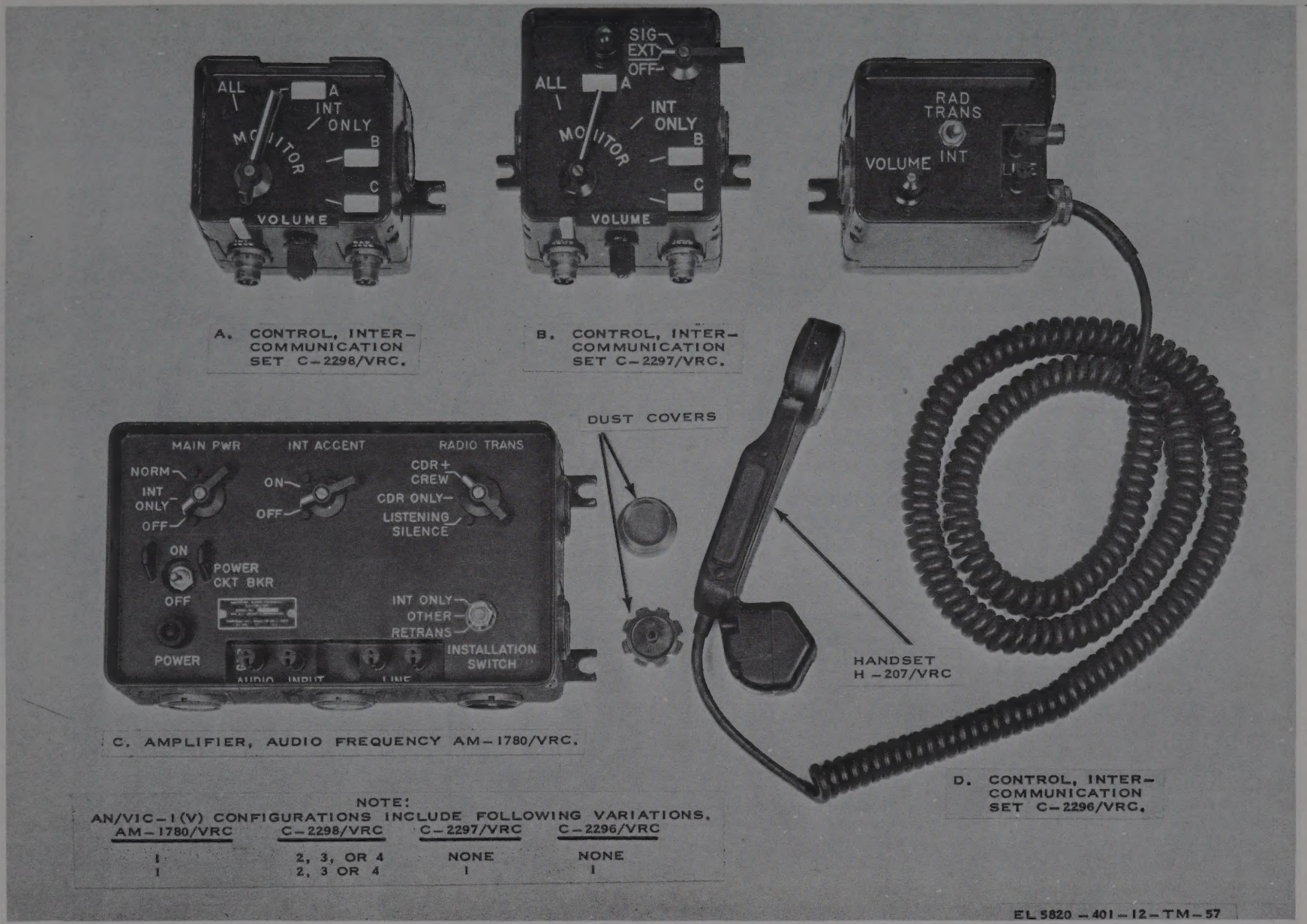


Figure 2-16. Intercommunication Set AN/VIC-1(V), components.

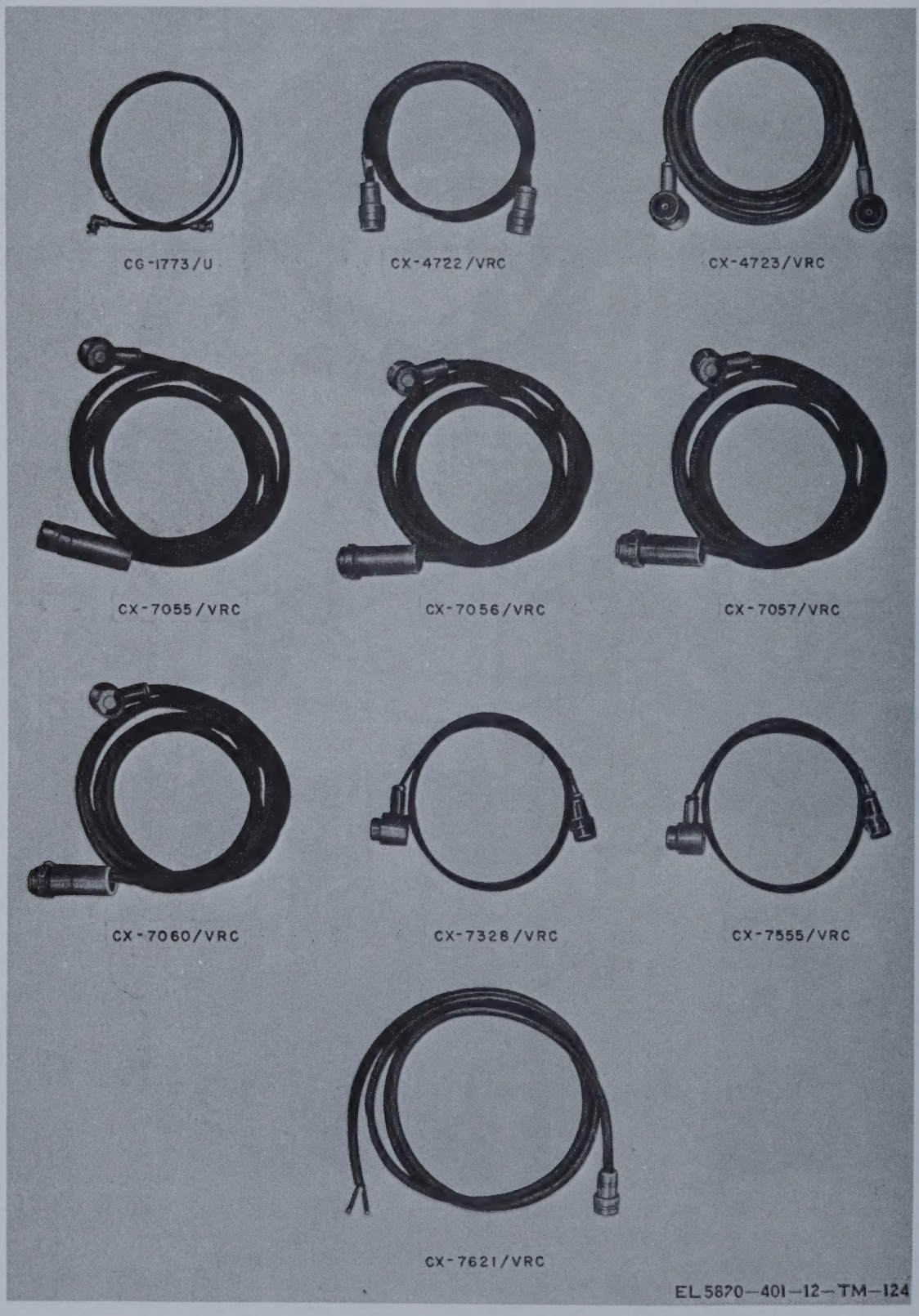


Figure 2-17. Typical cable assemblies used with AN/VRC-12 series radios and radio-intercom system installation.

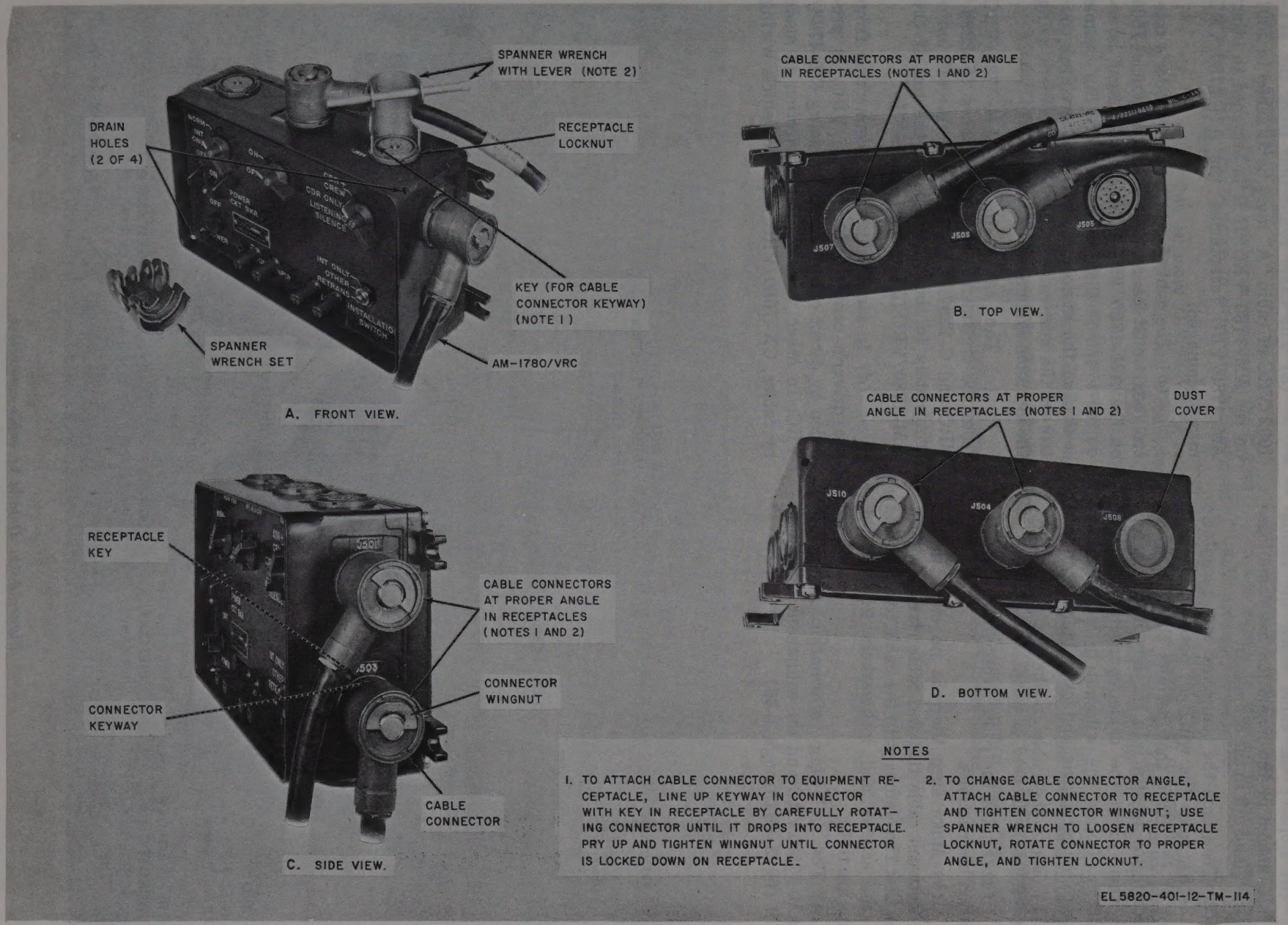

SPANNER WRENCH WITH LEVER (NOTE 2)
DRAIN HOLES (2 OF 4)
RECEPTACLE LOCKNUT
KEY (FOR CABLE CONNECTOR KEYWAY) (NOTE 1)
SPANNER WRENCH SET
AM-1780/VRC
A. FRONT VIEW.
CABLE CONNECTORS AT PROPER ANGLE IN RECEPTACLES (NOTES 1 AND 2)
J507
J508
J505
B. TOP VIEW.
RECEPTACLE KEY
J501
CABLE CONNECTORS AT PROPER ANGLE IN RECEPTACLES (NOTES 1 AND 2)
J503
CONNECTOR WINGNUT
CONNECTOR KEYWAY
CABLE CONNECTOR
C. SIDE VIEW.
CABLE CONNECTORS AT PROPER ANGLE IN RECEPTACLES (NOTES 1 AND 2)
DUST COVER
J510
J504
J506
D. BOTTOM VIEW.
NOTES
1. TO ATTACH CABLE CONNECTOR TO EQUIPMENT RECEPTACLE, LINE UP KEYWAY IN CONNECTOR WITH KEY IN RECEPTACLE BY CAREFULLY ROTATING CONNECTOR UNTIL IT DROPS INTO RECEPTACLE. PRY UP AND TIGHTEN WINGNUT UNTIL CONNECTOR IS LOCKED DOWN ON RECEPTACLE.
2. TO CHANGE CABLE CONNECTOR ANGLE, ATTACH CABLE CONNECTOR TO RECEPTACLE AND TIGHTEN CONNECTOR WINGNUT; USE SPANNER WRENCH TO LOOSEN RECEPTACLE LOCKNUT, ROTATE CONNECTOR TO PROPER ANGLE, AND TIGHTEN LOCKNUT.
EL 5820-401-12-TM-114

Figure 2-18. AM-1780/VRC, cabling details.

(*d*) Replace the cable when the insulation is damaged or the insulation has come loose from the gland nut in the connector.

(2) To attach the connector to a receptacle (fig. 2–18), raise the wingnut, position the connector at the angle that permits the keyway in the connector to slip into the key in the receptacle, then press the cable connector into the receptacle. Rotate the wingnut to lock the connector to the receptacle, and lower the wingnut.

(3) Route the cable to the assigned equipment receptacle.

(*a*) Follow the route prescribed in the installation instructions.

(*b*) Make sure there is no slack in the cable between cable ties and cable clamps. Check to see that the clamps grip the cable securely and that the screws and lockwashers holding the clamps are tight.

(4) The following information applies to the AM–1780/VRC and the equipment associated with it (fig. 2–28 through 2–35).

(*a*) The cable connection from the MT–1092/VRC of radio "A" must be attached to J501 on the AM–1780/VRC. If it is attached to other AM–1780/VRC receptacles, the AM–1780/VRC may be damaged.

(*b*) The cable from the commander's control box, must be connected to receptacle J504 on the AM–1780/VRC. This arrangement is required to insure that the commander can assume control of the radio circuits thus overriding control of the system by other crewmembers using the intercom system.

(*c*) The cables to the AM–1780/VRC from the crewmember's control boxes (C–2298/VRC and C–2297/VRC) can be connected indiscriminately to the receptacle on the top of the AM–1780/VRC (J505, J506, and J507).

(*d*) In some vehicles, the connection from the driver's control box, C–2297/VRC, is provided by direct cable connection using CX–4723/VRC. In other vehicles, the connection is made by cables, CX–7060/VRC, and the vehicle wiring

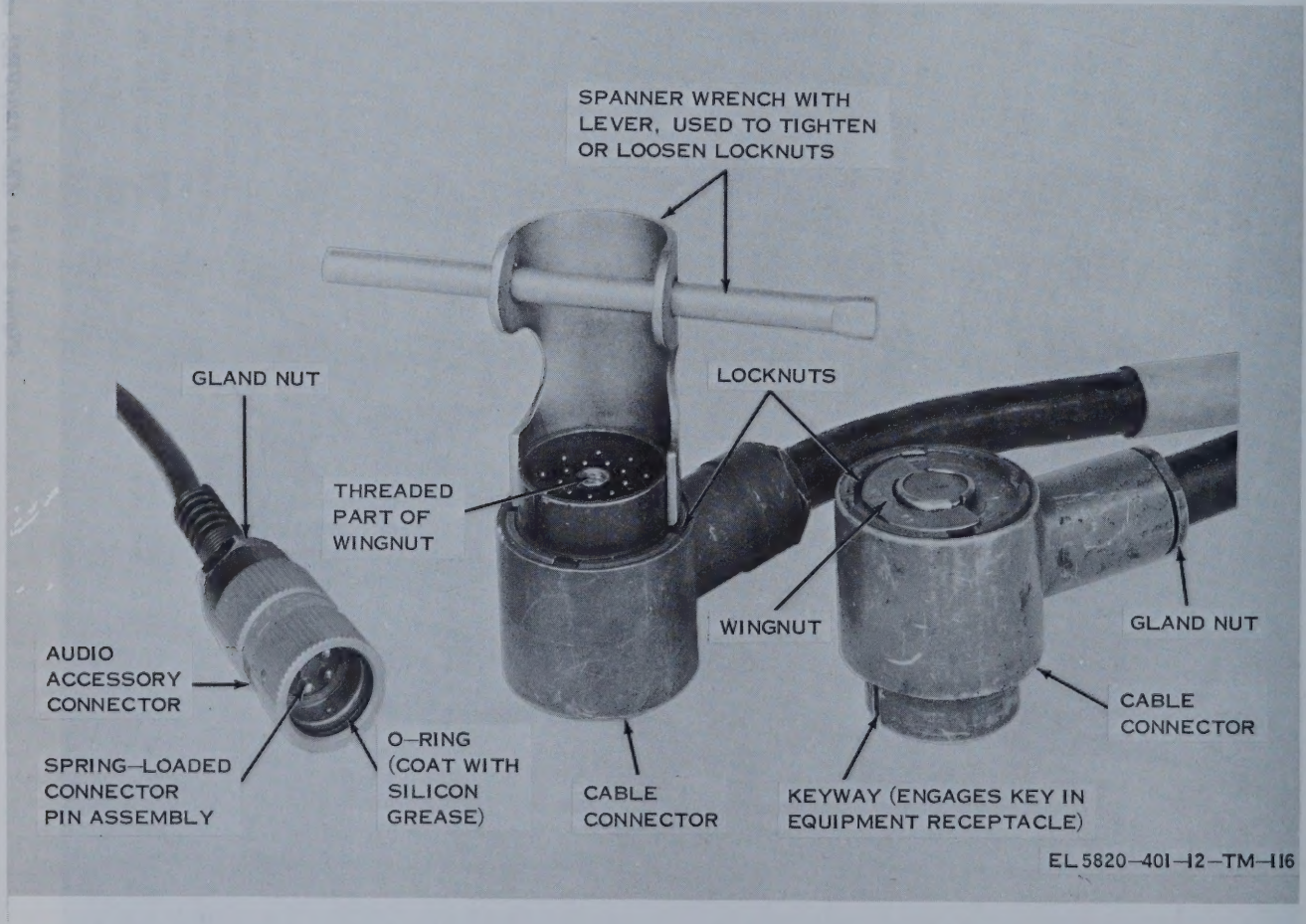


Figure 2–19. Details of cable connectors.

which usually includes the vehicle slip-ring assemblies.

(*e*) The cable connections to the C–2298/VRC's can be made to either the left or right receptacle.

(*f*) One or more C–2298/VRC's can be connected to a C–2298/VRC that is connected to the AM–1780/VRC, using CX–4723/VRC's for the purpose. All C–2298/VRC's operate independently of each other when they are so connected.

(*g*) The left receptacle, J701, of the C–2299/VRC must be connected to J511 on the AM–1780/VRC; J702, in turn, is then connected to J509 on the AM–1780/VRC.

(*h*) In some tank installation, a branched cable, connected on one end to the commander's C–2298/VRC, is terminated in audio connectors in the cupola to which the tank commander's audio accessory is connected.

c. Cabling Diagrams.

(1) Figures 2–20 through 2–27 show typical cabling of the AN/VRC–12 series radios as they are used in vehicles in which there is no radio-intercom system.

(2) Figures 2–28 through 2–35 show typical cabling of the radio intercom system used with each configuration of the AN/VRC–12 series radios. Refer to *b*(4) above for information concerning common alterations affecting cabling shown in the figures.

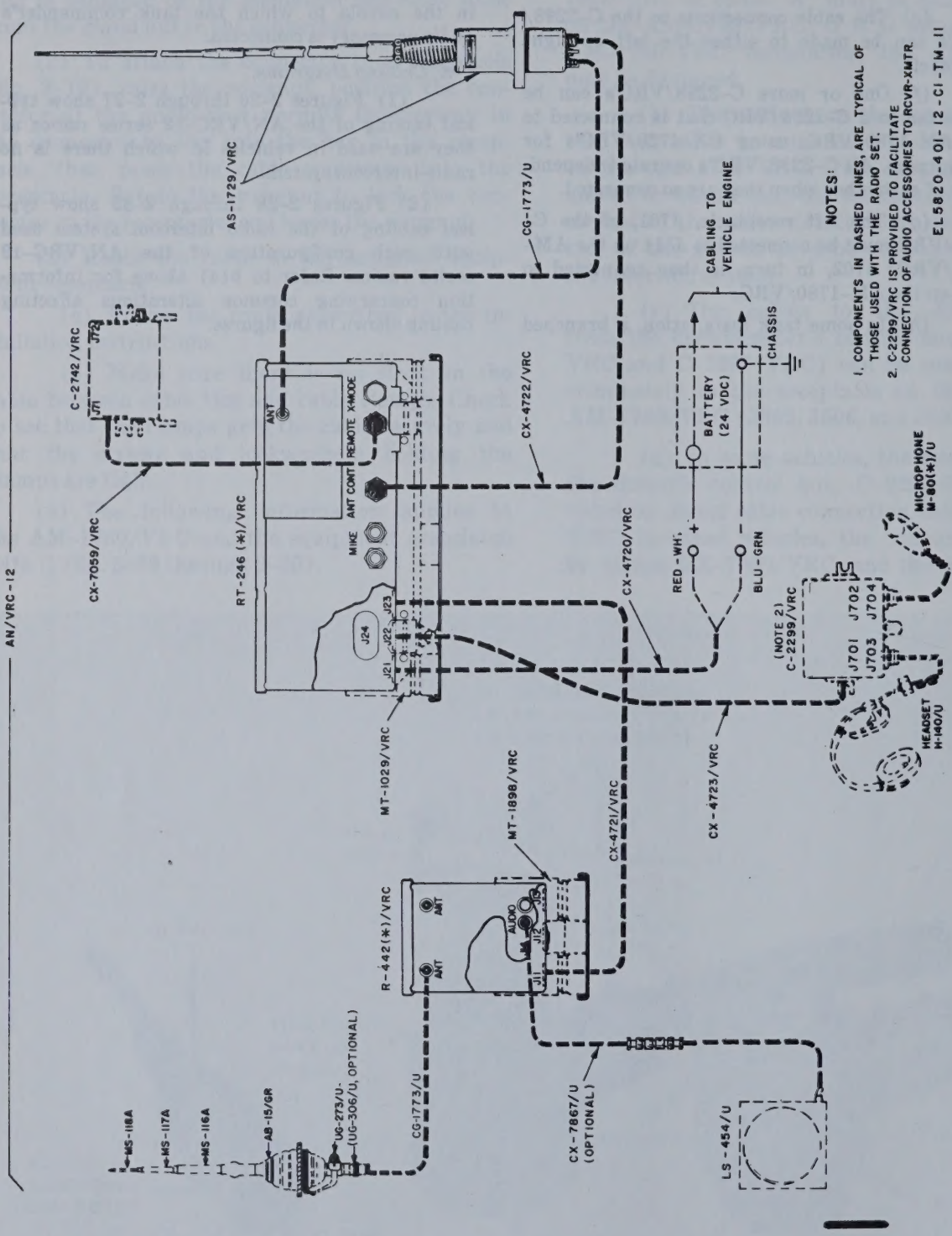


Figure 2-20. Typical cabling diagram for AN/VRC-12.

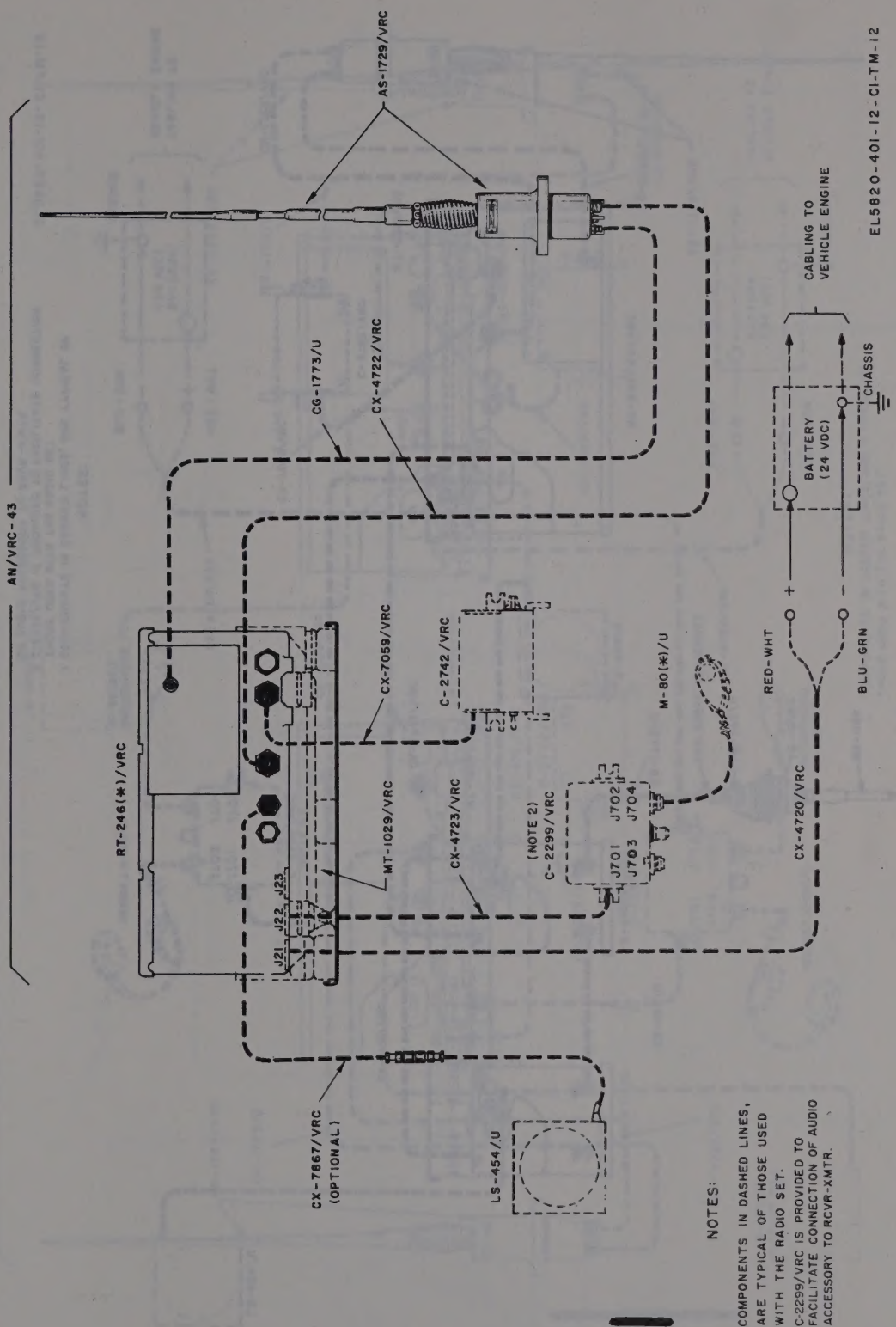
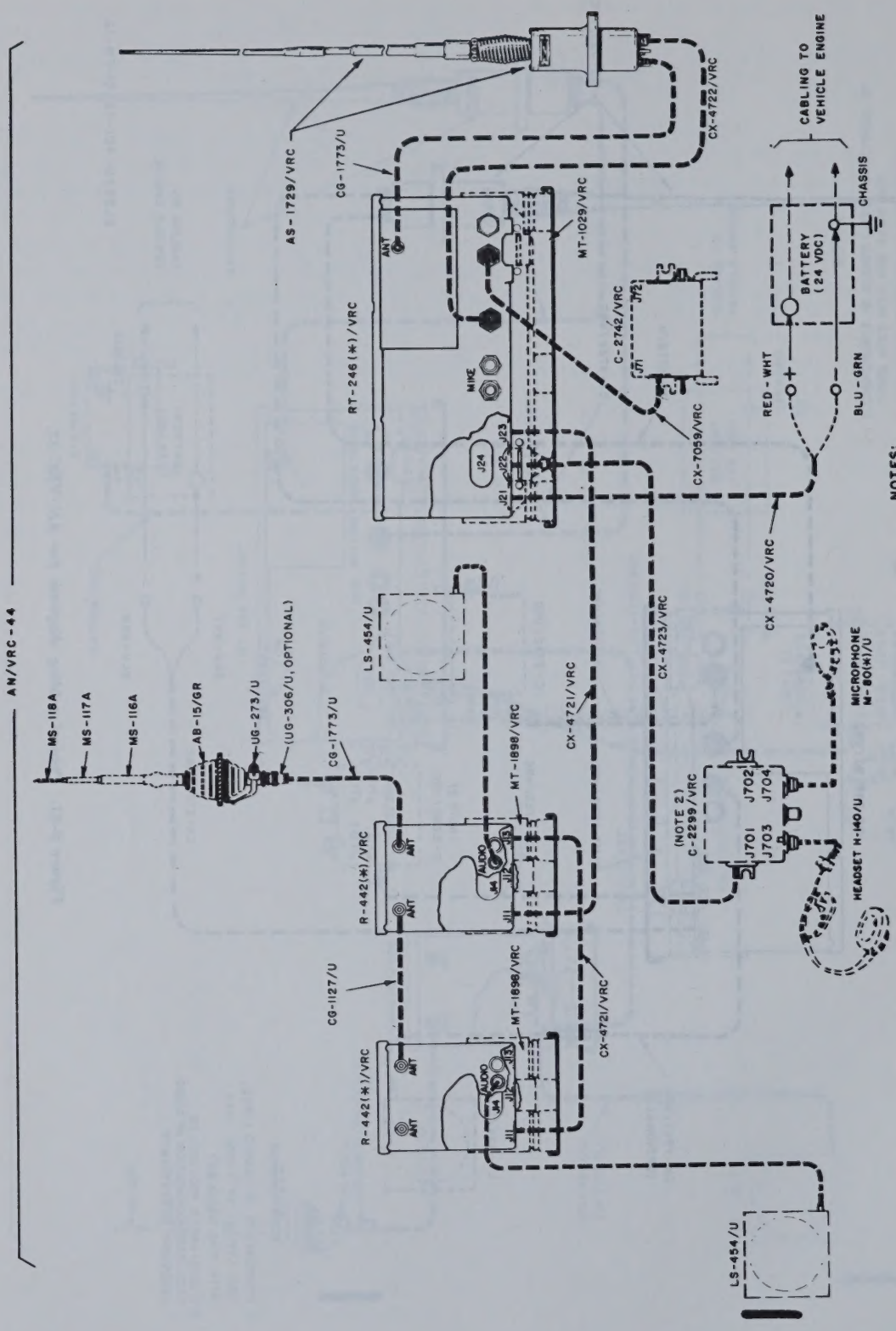


Figure 2-21. Typical cabling diagram for AN/VRC-43.



NOTES:
1. COMPONENTS IN DASHED LINES, ARE TYPICAL OF THOSE USED WITH THE RADIO SET.
2. C-2299/VRC IS PROVIDED TO FACILITATE CONNECTION OF AUDIO ACCESSORY TO RCVR-XMTR.

EL5820-401-12-CI-TM-13

Figure 2-22. Typical cabling diagram for AN/VRC-44.

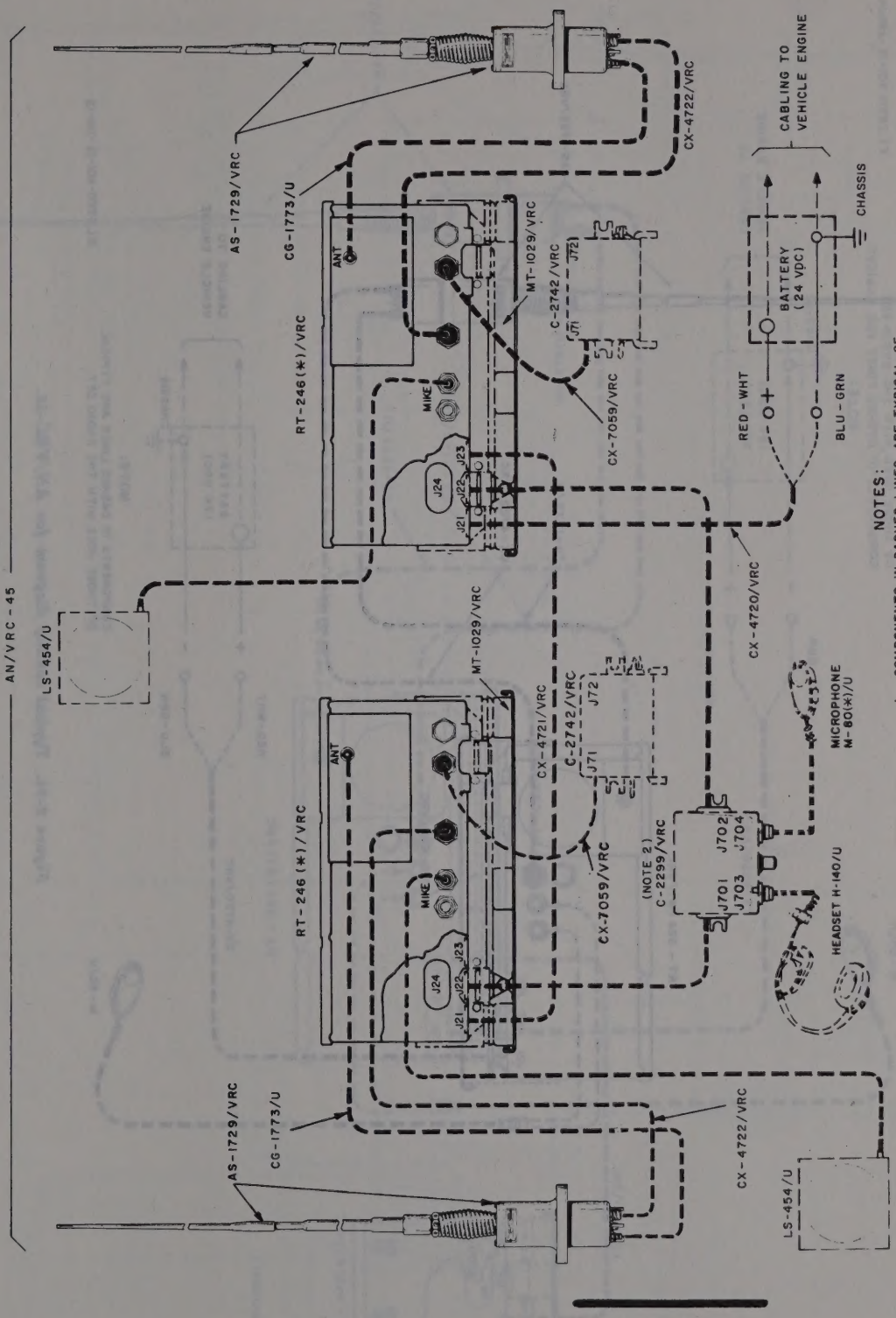


Figure 2-23. Typical cabling diagram for AN/VRC-45.

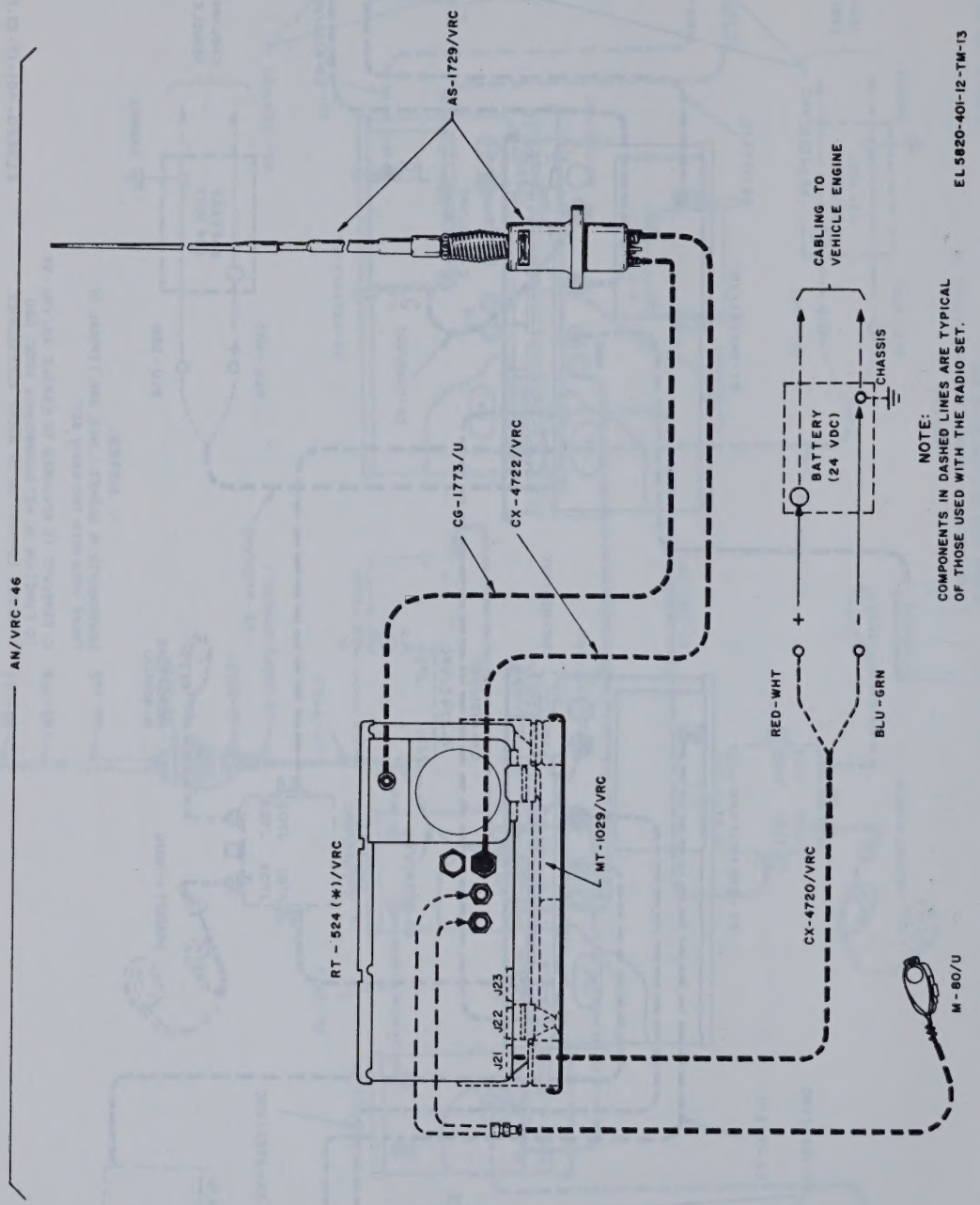


Figure 2-24. Typical cabling diagram for AN/VRC-46.

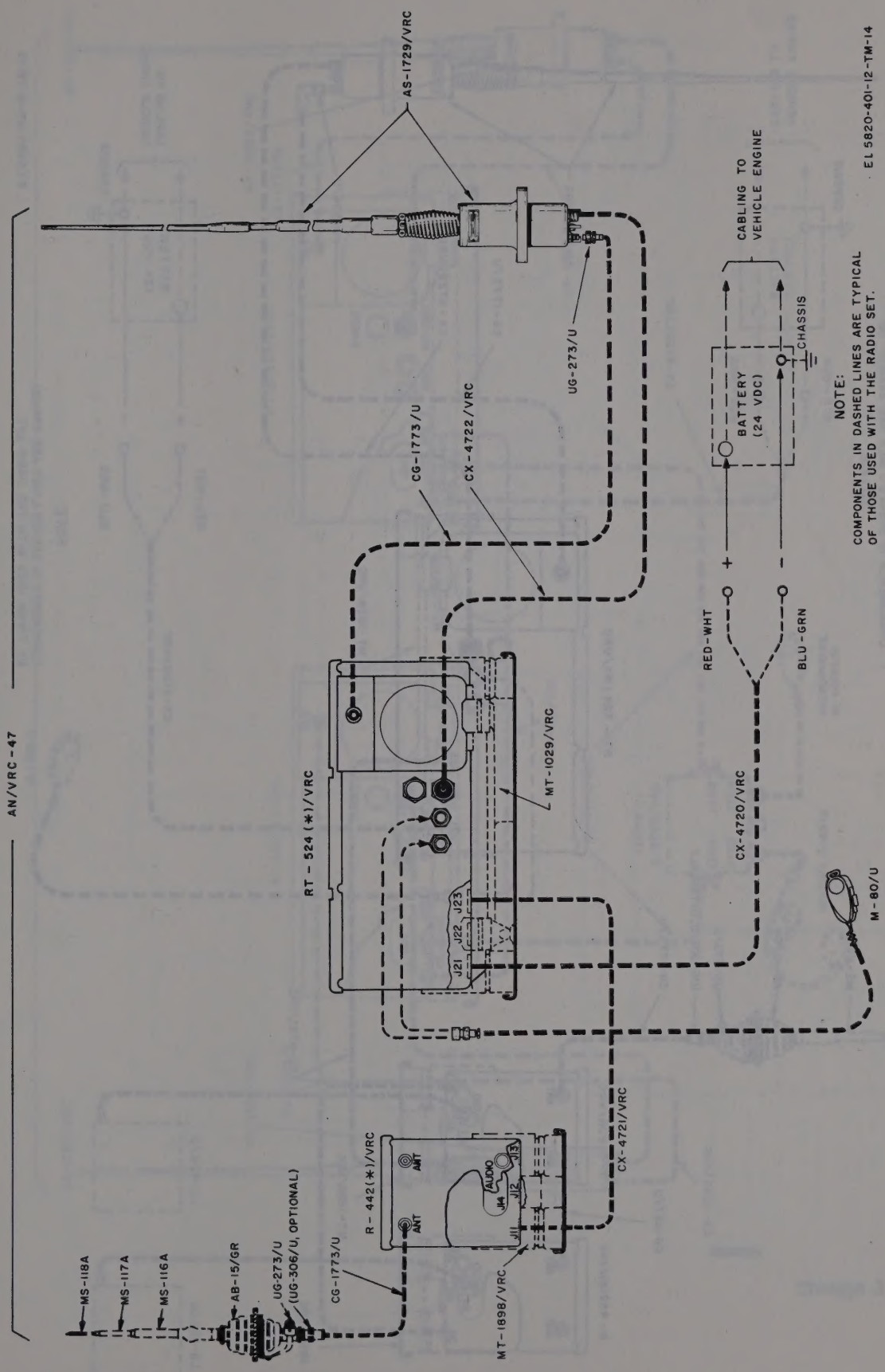


Figure 2-25. Typical cabling diagram for AN/VRC-47.

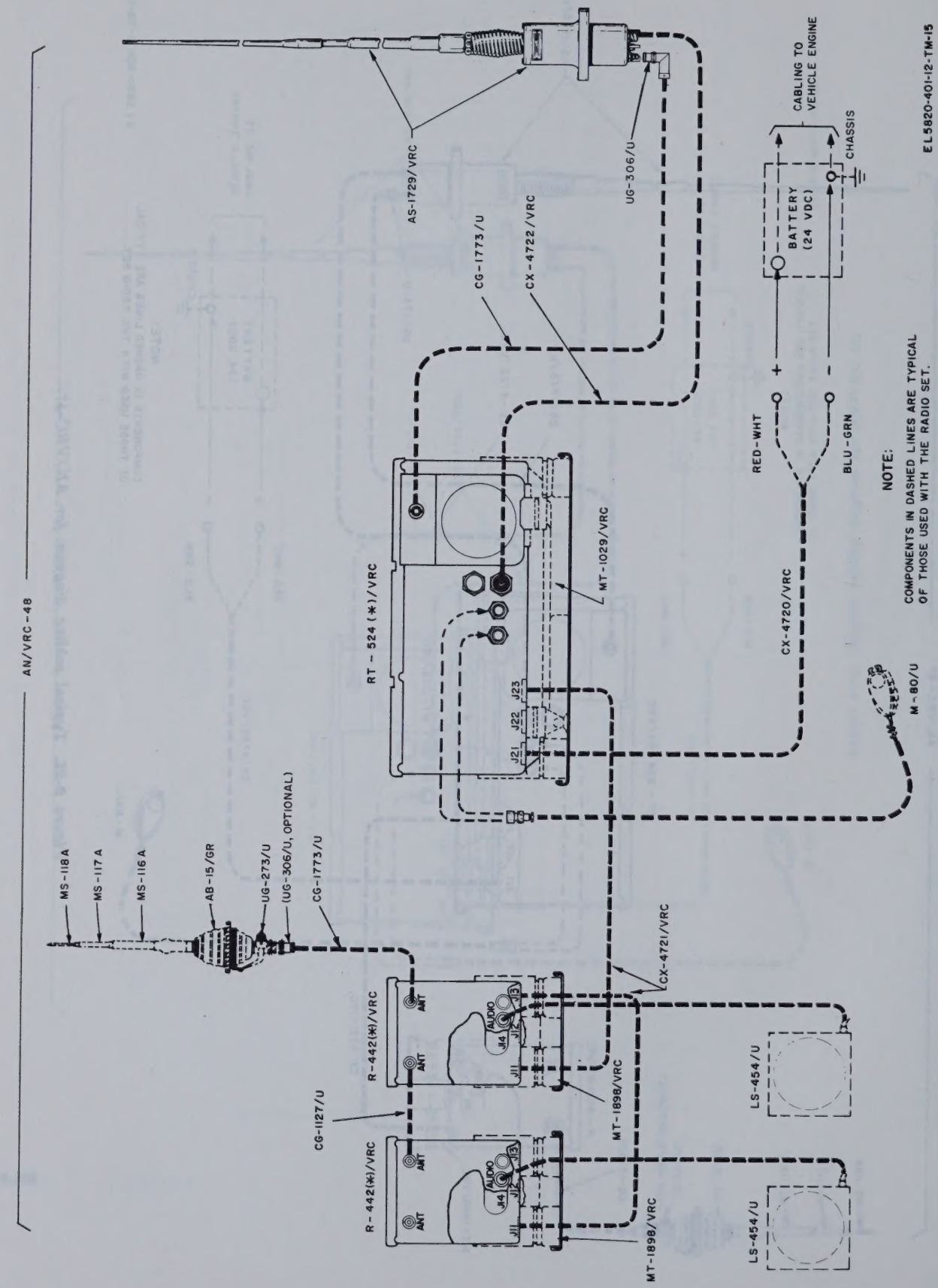


Figure 2-26. Typical cabling diagram for AN/VRC-48.

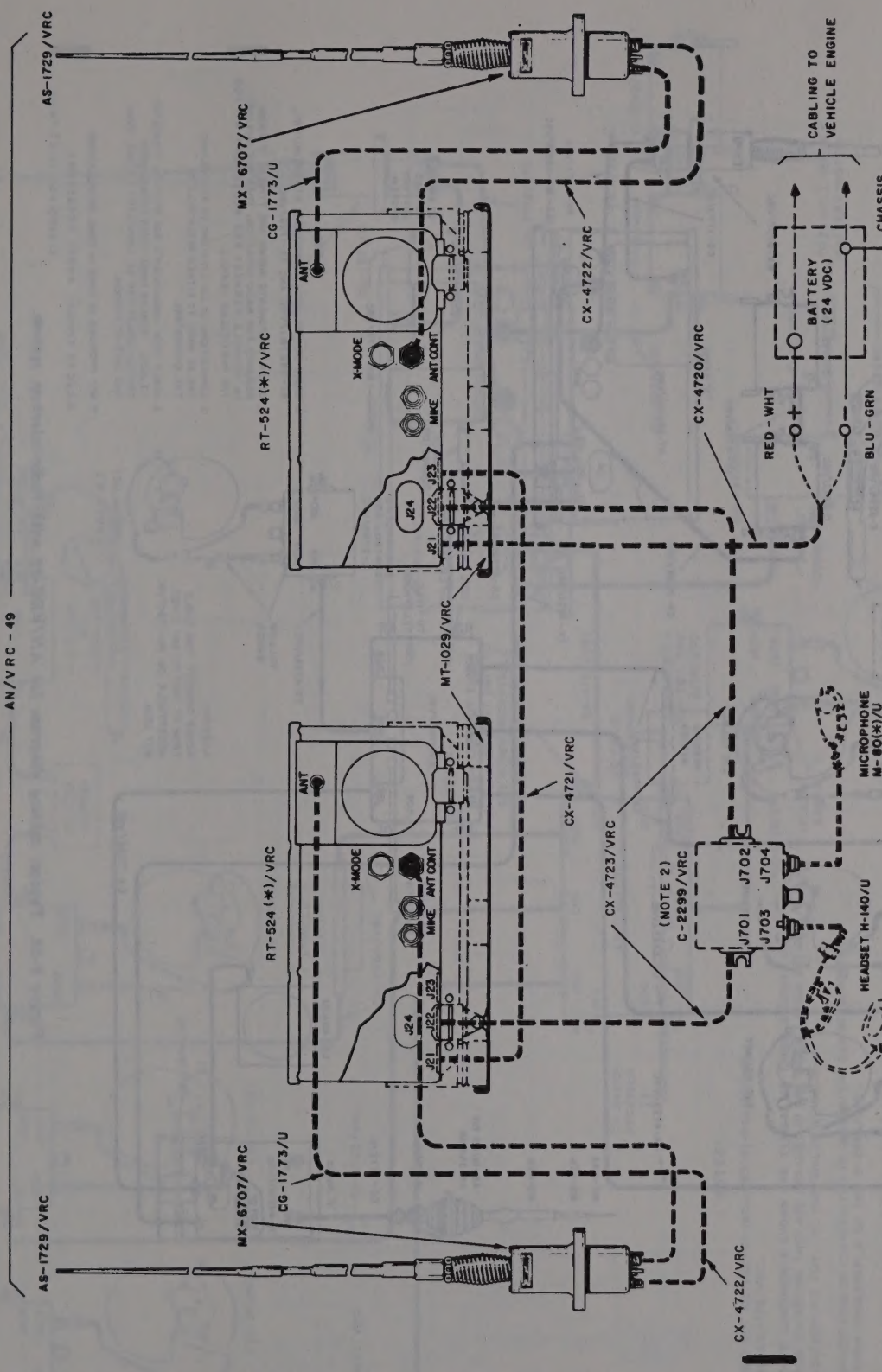


Figure 2-27. Typical cabling diagram for AN/VRC-49.

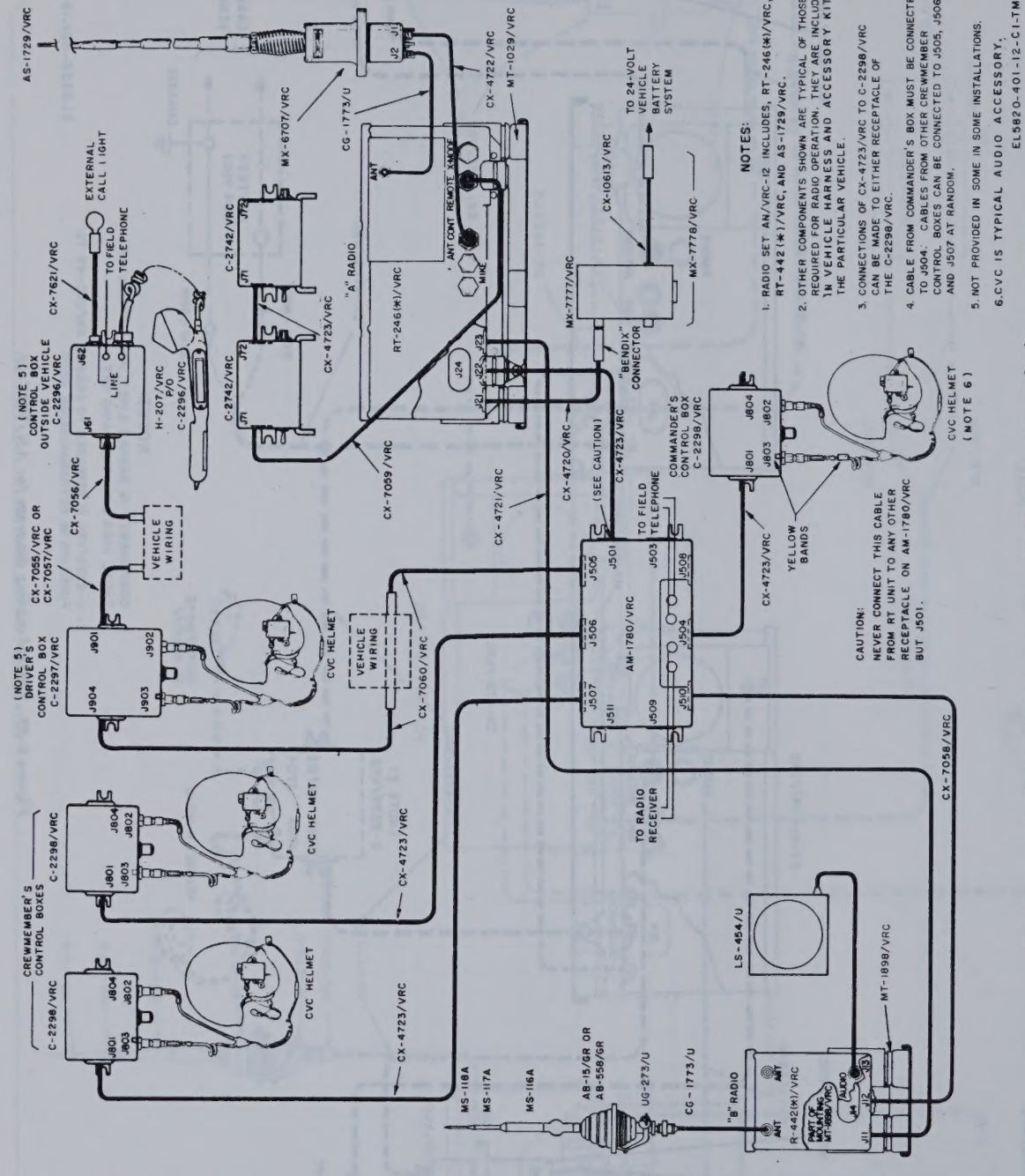
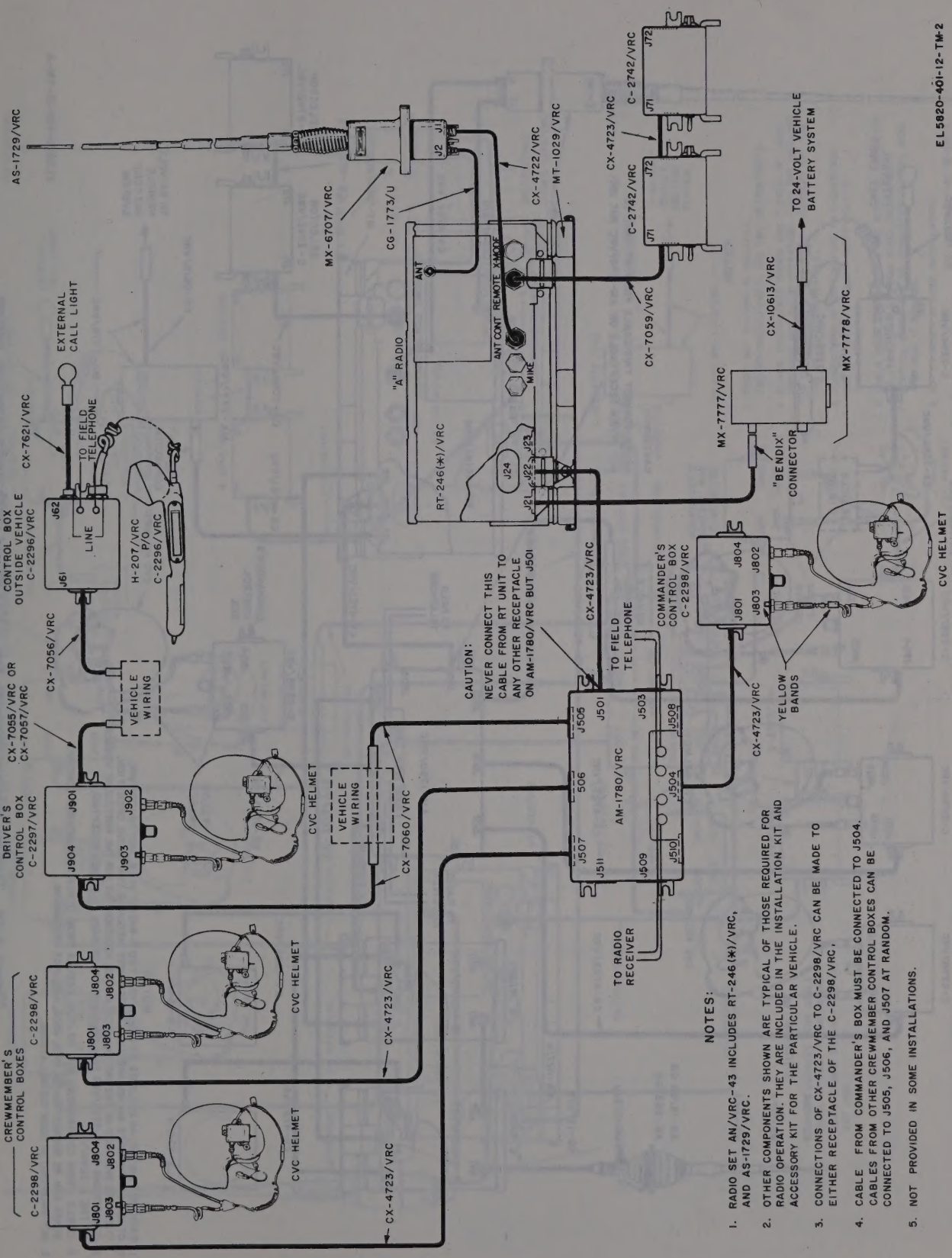


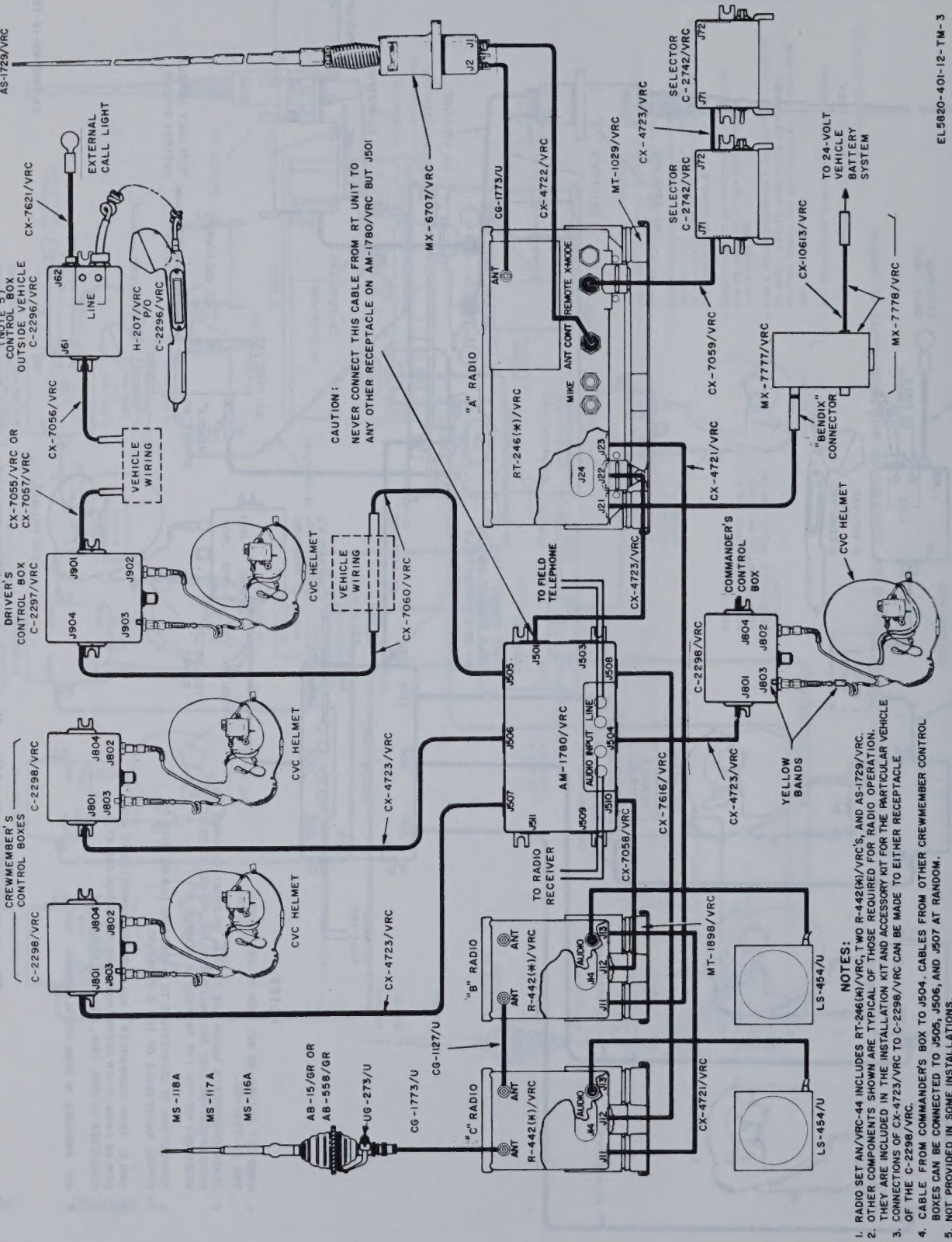
Figure 2-28. Typical cabling diagram for AN/VRC-12 with radio-intercom system.



NOTES:

1. RADIO SET AN/VRC-43 INCLUDES RT-246(*)/VRC, AND AS-1729/VRC.
2. OTHER COMPONENTS SHOWN ARE TYPICAL OF THOSE REQUIRED FOR RADIO OPERATION. THEY ARE INCLUDED IN THE INSTALLATION KIT AND ACCESSORY KIT FOR THE PARTICULAR VEHICLE.
3. CONNECTIONS OF CX-4723/VRC TO C-2298/VRC CAN BE MADE TO EITHER RECEPTACLE OF THE C-2298/VRC.
4. CABLE FROM COMMANDER'S BOX MUST BE CONNECTED TO J504. CABLES FROM OTHER CREWMEMBER CONTROL BOXES CAN BE CONNECTED TO J505, J506, AND J507 AT RANDOM.
5. NOT PROVIDED IN SOME INSTALLATIONS.

Figure 2-29. Typical cabling diagram for AN/VRC-43 with radio-intercom system.



NOTES:

1. RADIO SET AN/VRC-44 INCLUDES RT-246(*)/VRC, TWO R-442(*)/VRC'S, AND AS-1729/VRC.
2. OTHER COMPONENTS SHOWN ARE TYPICAL OF THOSE REQUIRED FOR RADIO OPERATION. THEY ARE INCLUDED IN THE INSTALLATION KIT AND ACCESSORY KIT FOR THE PARTICULAR VEHICLE
3. CONNECTIONS OF CX-4723/VRC TO C-2298/VRC CAN BE MADE TO EITHER RECEPTACLE OF THE C-2298/VRC.
4. CABLE FROM COMMANDER'S BOX TO J504. CABLES FROM OTHER CREWMEMBER CONTROL BOXES CAN BE CONNECTED TO J505, J506, AND J507 AT RANDOM.
5. NOT PROVIDED IN SOME INSTALLATIONS.

Figure 2-30. Typical cabling diagram for AN/VRC-44 with radio-intercom system.

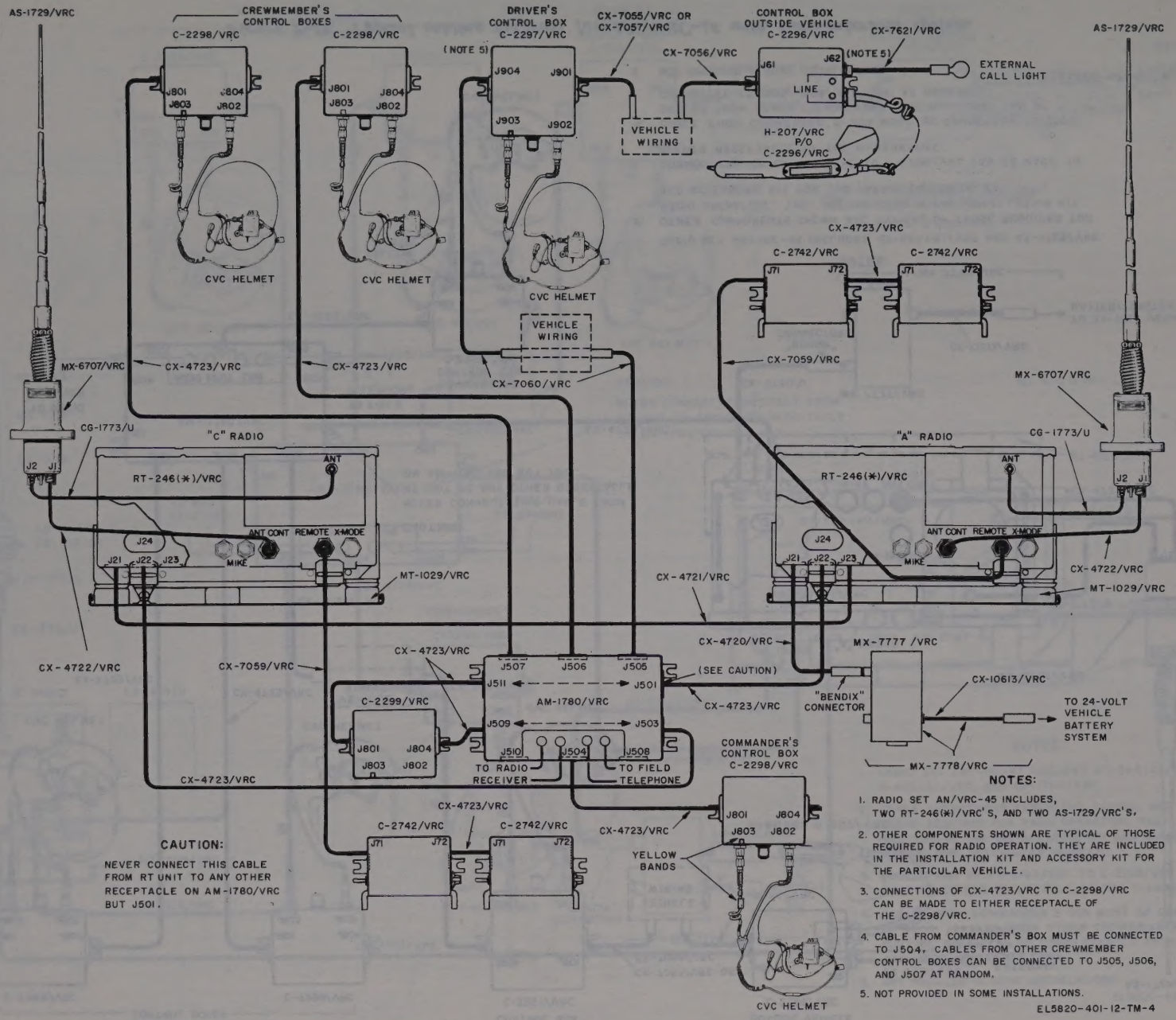
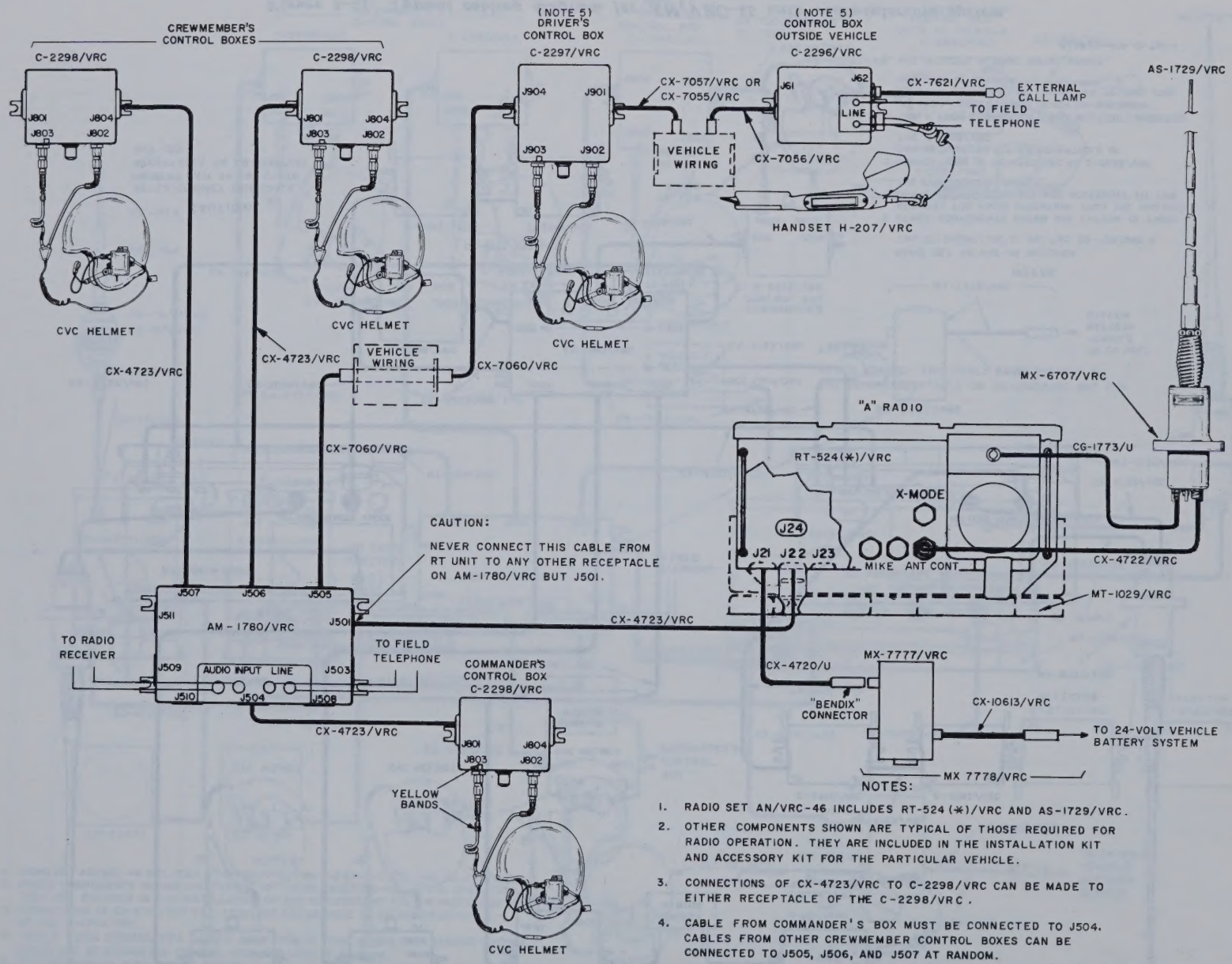


Figure 2-31. Typical cabling diagram for AN/VRC-45 with radio-intercom system.



NOTES:

1. RADIO SET AN/VRC-46 INCLUDES RT-524(*)/VRC AND AS-1729/VRC.
2. OTHER COMPONENTS SHOWN ARE TYPICAL OF THOSE REQUIRED FOR RADIO OPERATION. THEY ARE INCLUDED IN THE INSTALLATION KIT AND ACCESSORY KIT FOR THE PARTICULAR VEHICLE.
3. CONNECTIONS OF CX-4723/VRC TO C-2298/VRC CAN BE MADE TO EITHER RECEPTACLE OF THE C-2298/VRC.
4. CABLE FROM COMMANDER'S BOX MUST BE CONNECTED TO J504. CABLES FROM OTHER CREWMEMBER CONTROL BOXES CAN BE CONNECTED TO J505, J506, AND J507 AT RANDOM.
5. NOT PROVIDED IN SOME INSTALLATIONS.

EL5820-401-12-TM-5

Figure 2-32. Typical cabling diagram for AN/VRC-46 with radio-intercom system.

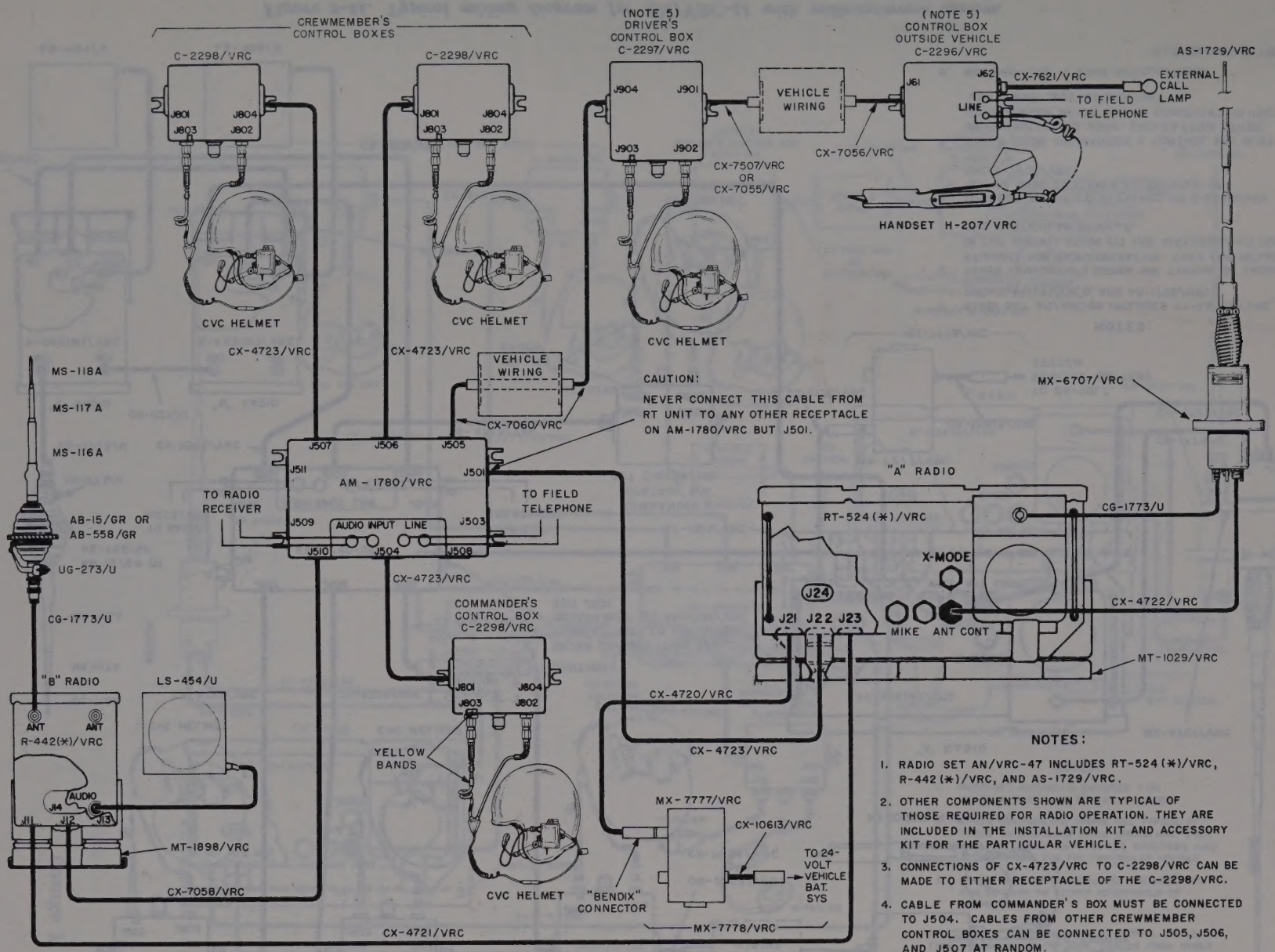
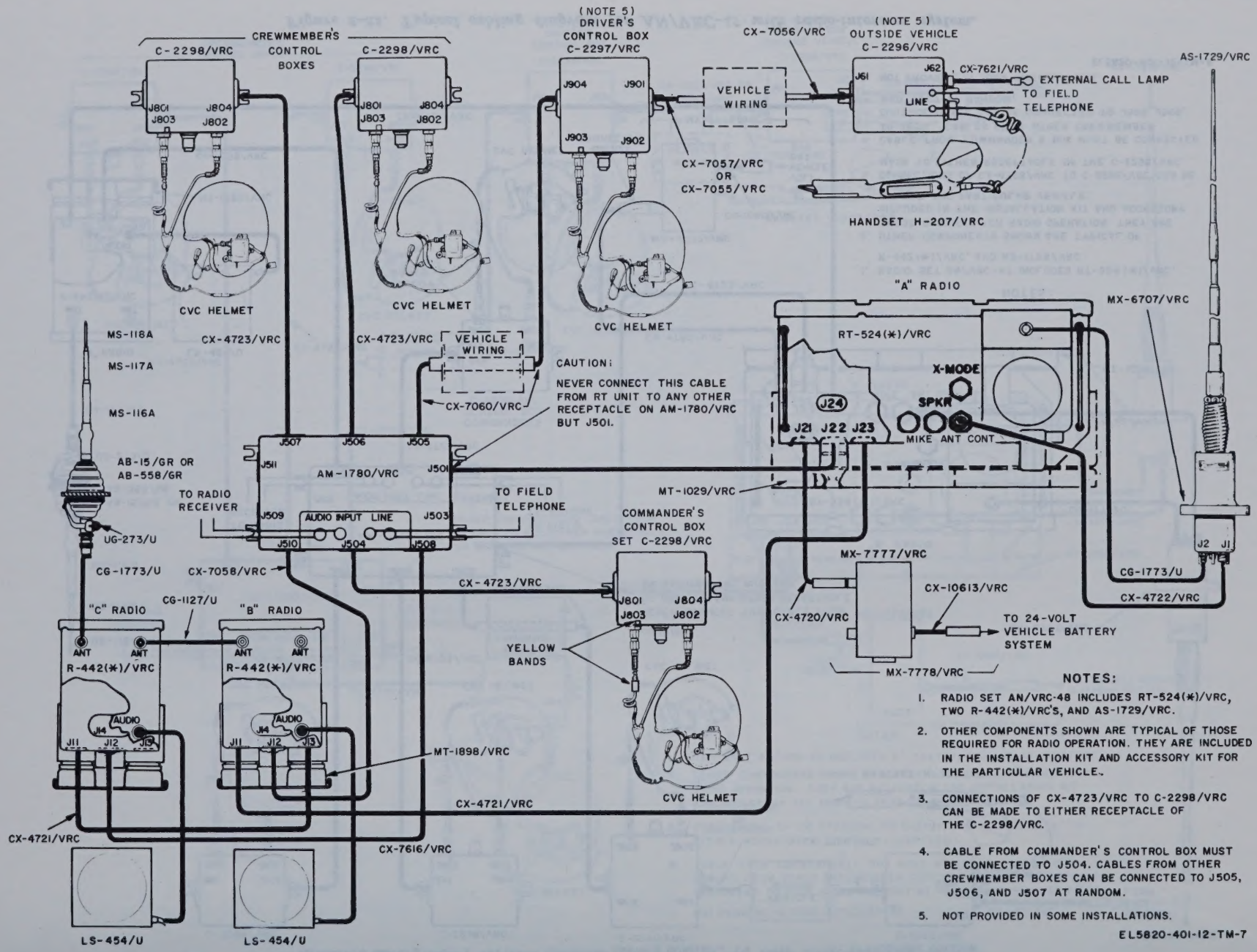


Figure 2–33. Typical cabling diagram for AN/VRC–47 with radio-intercom system.

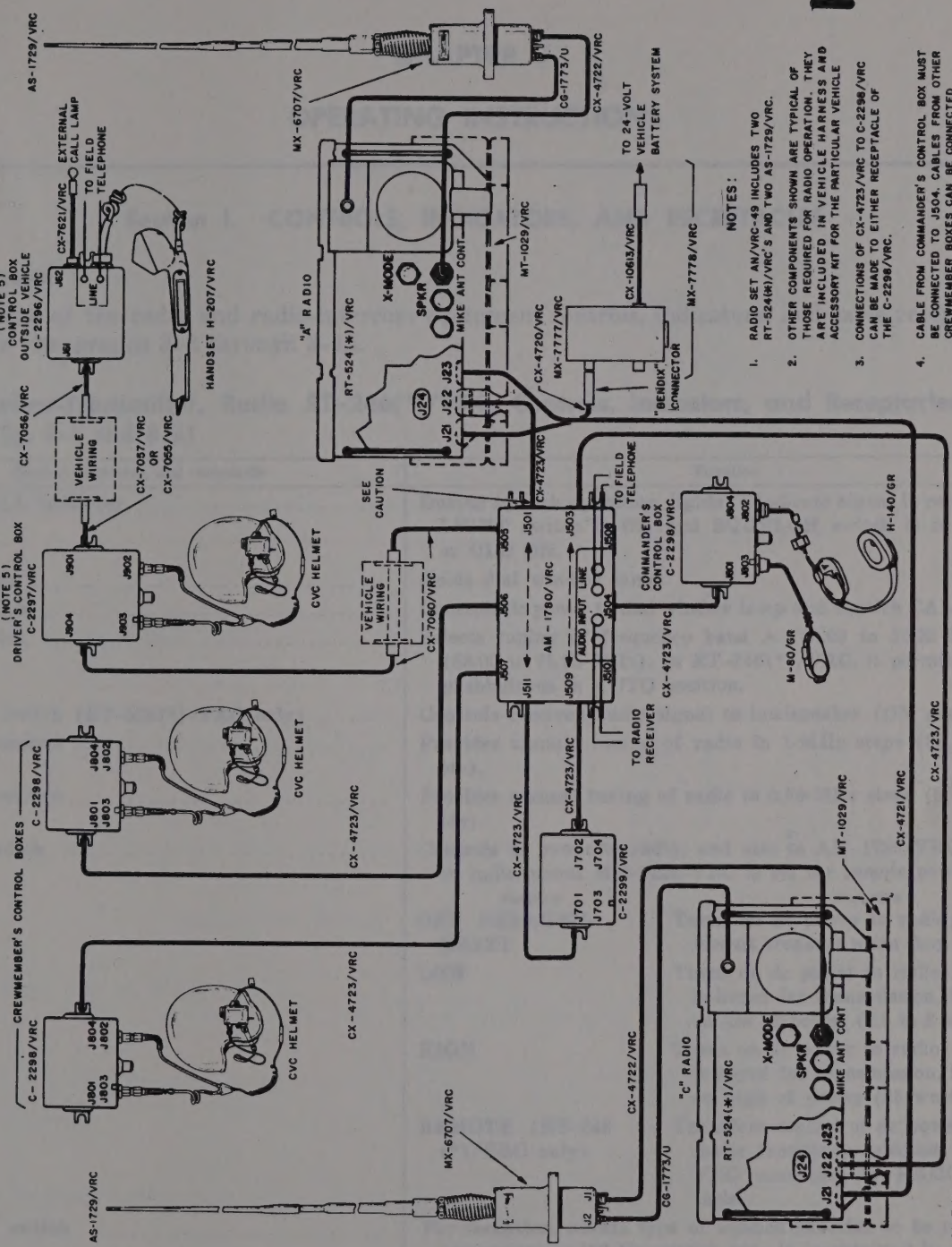


NOTES:

1. RADIO SET AN/VRC-48 INCLUDES RT-524(*)/VRC, TWO R-442(*)/VRC'S, AND AS-1729/VRC.
2. OTHER COMPONENTS SHOWN ARE TYPICAL OF THOSE REQUIRED FOR RADIO OPERATION. THEY ARE INCLUDED IN THE INSTALLATION KIT AND ACCESSORY KIT FOR THE PARTICULAR VEHICLE.
3. CONNECTIONS OF CX-4723/VRC TO C-2298/VRC CAN BE MADE TO EITHER RECEPTACLE OF THE C-2298/VRC.
4. CABLE FROM COMMANDER'S CONTROL BOX MUST BE CONNECTED TO J504. CABLES FROM OTHER CREWMEMBER BOXES CAN BE CONNECTED TO J505, J506, AND J507 AT RANDOM.
5. NOT PROVIDED IN SOME INSTALLATIONS.

EL5820-401-12-TM-7

Figure 2-34. Typical cabling diagram for AN/VRC-48 with radio-intercom system.

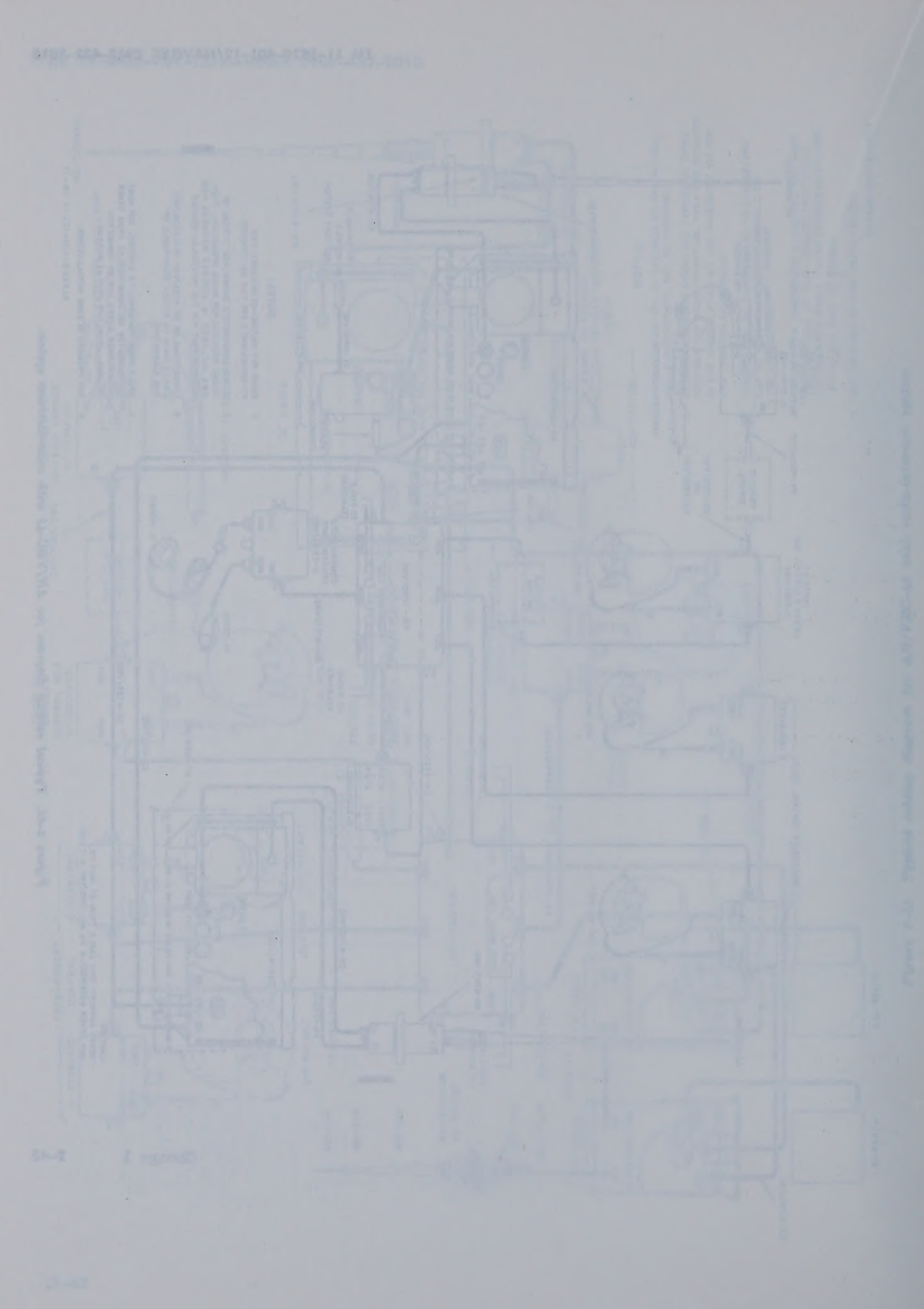


NOTES:

1. RADIO SET AN/VRC-49 INCLUDES TWO RT-524(*)/VRC'S AND TWO AS-1729/VRC.
2. OTHER COMPONENTS SHOWN ARE TYPICAL OF THOSE REQUIRED FOR RADIO OPERATION. THEY ARE INCLUDED IN VEHICLE HARNESS AND ACCESSORY KIT FOR THE PARTICULAR VEHICLE
3. CONNECTIONS OF CX-4723/VRC TO C-2298/VRC CAN BE MADE TO EITHER RECEPTACLE OF THE C-2298/VRC.
4. CABLE FROM COMMANDER'S CONTROL BOX MUST BE CONNECTED TO J504. CABLES FROM OTHER CREWMEMBER BOXES CAN BE CONNECTED TO J505, J506, AND J507 AT RANDOM.
5. NOT PROVIDED IN SOME INSTALLATIONS.

EL5820-401-12-C1-TM-17

Figure 2-35. Typical cabling diagram for AN/VRC-49 with radio-intercom system.



CHAPTER 3

OPERATING INSTRUCTIONS

Section I. CONTROLS, INDICATORS, AND RECEPTACLES

3-1. General

The functions of the radio and radio-intercom equipment controls, indicators, and cable receptacles are provided in paragraphs 3-2 through 3-15.

3-2. Receiver-Transmitter, Radio RT-246(*)/VRC, Controls, Indicators, and Receptacles (fig. 3-1 and 3-2)

Control, indicator, and receptacle	Function
Squelch CALL indicator	During squelch operation, lights to indicate signal is received, when LIGHT switch is ON and SQUELCH switch is in NEW ON or OLD ON.
LAMP holder	Holds dial window lamp.
LIGHT switch	Controls dc power to dial window lamp and squelch CALL indicator.
BAND switch	Selects tuning of frequency band A (30.00 to 52.95 MHz) or B (53.00 to 75.95 MHz). In RT-246(*)/VRC, it permits tuning by pushbuttons in AUTO position.
SPEAKER switch (RT-524(*)/VRC only)	Controls received audio signal to loudspeaker (ON and OFF).
MC tuning control	Provides manual tuning of radio in 1-MHz steps (30, 31, 53, 54, etc).
KC tuning control	Provides manual tuning of radio in 0.05-MHz steps (00, 05, 10, 15, etc).
POWER switch	Controls dc power to radio; and also to AM-1780/VRC when link in radio mount MT-1029/VRC is set for remote power control. *Position* — *Function* OFF BREAKER-RESET — Turns off dc power to radio; and resets circuit breakers when they are tripped. LOW — Turns on dc power to radio; when radio is keyed for transmission, it transmits on low rf power (0.5 to 8 watts). HIGH — Turns on dc power to radio; when radio is keyed for transmission, it transmits on high rf power (35 watts, min). REMOTE (RT-246(*)/VRC only) — Transfers control of dc power and automatic frequency selection to C-2742/VRC connected to REMOTE receptacle.
SQUELCH switch	For reception, selects type of squelch function to be used; during transmission, 150-Hz squelch tone is transmitted in all positions of the switch except OLD ON. *Position* — *Function* NEW ON and OLD ON — Turns off (squelches) receiver to prevent rushing noise from being heard until squelch signal is received. *a.* In NEW ON, 150-Hz squelch tone unsquelches the receiver. *b.* In OLD ON, noise that is part of the distant transmitter carrier frequency unsquelches the receiver.

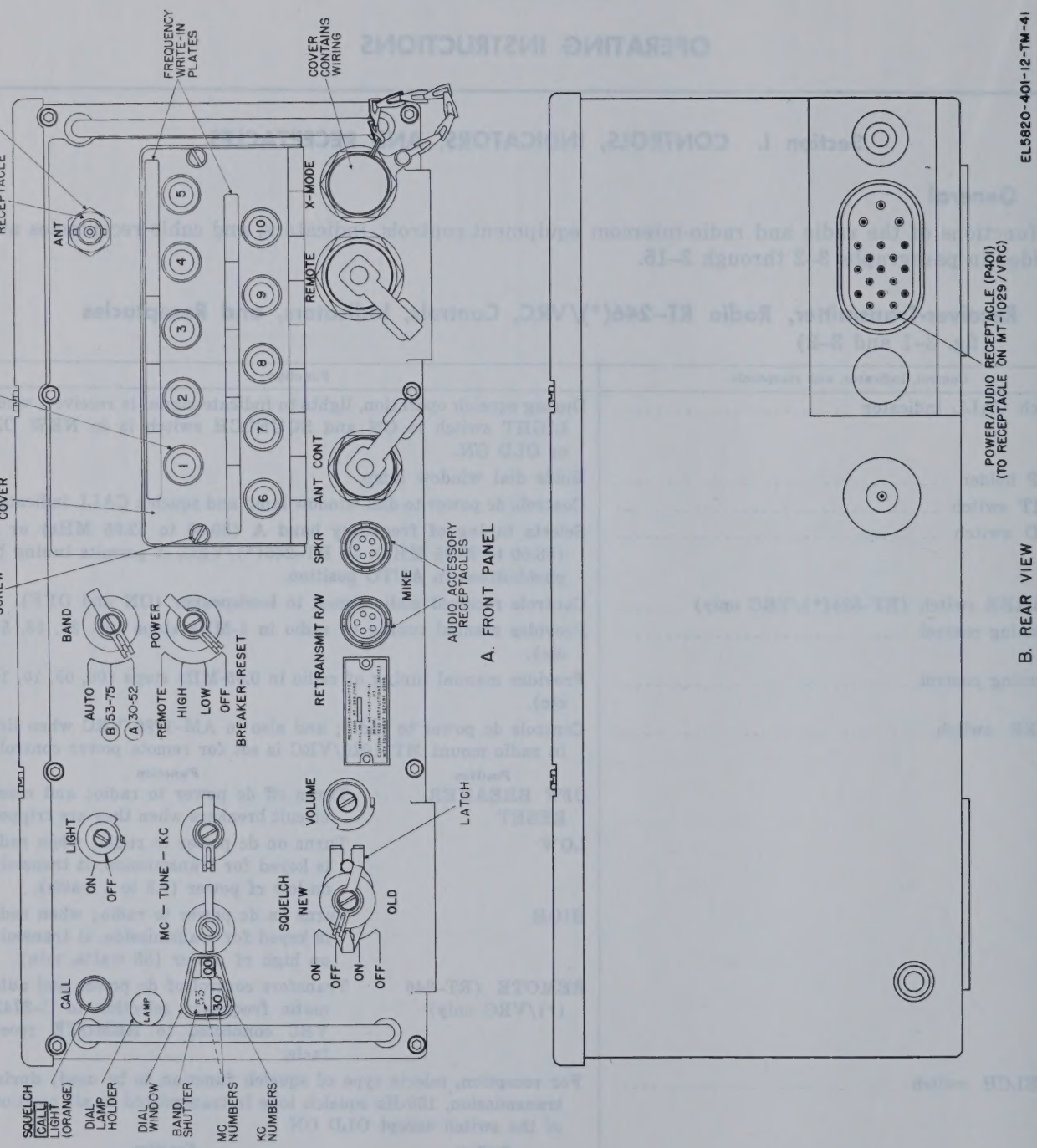


Figure 3-1. RT-246(*)/VRC, controls, indicators, and receptacles.

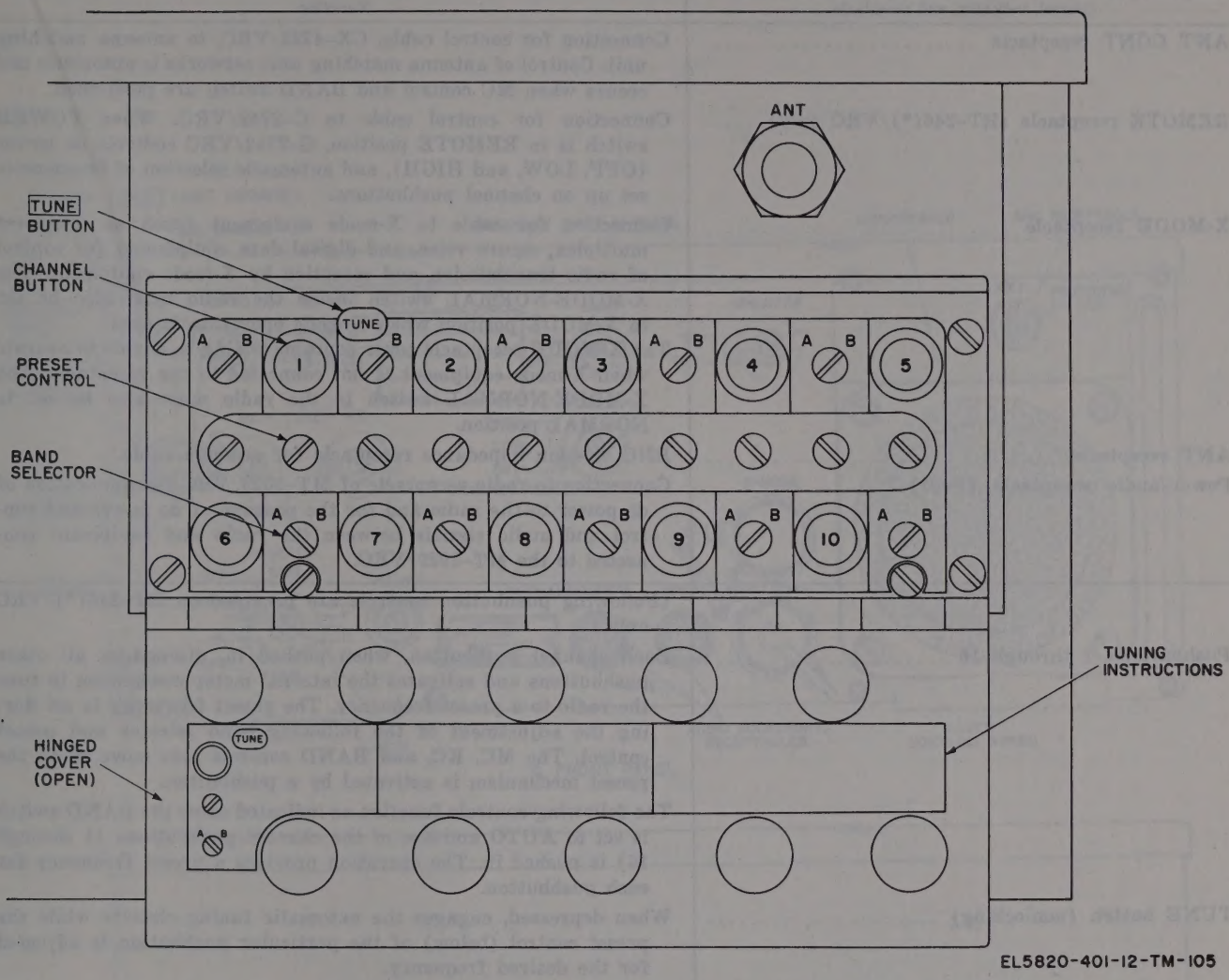


Figure 3-2. RT-246(*)/VRC, pushbutton tuning controls.

Control, indicator, and receptacle	Function
NEW OFF and OLD OFF	Receiver is in unsquelched condition (on standby, rushing noise is heard).
SQUELCH switch latch	When to right, it confines the SQUELCH switch to two upper positions (NEW) or two lower positions (OLD).
VOLUME control	Controls audio output; except to the ALL position of the MONITOR switch on controls boxes C-2297/VRC and C-2298/VRC in radio-intercom system; and except retransmission signals.
RETRANSMIT R/W receptacle	Connection for following functions: *a.* Audio accessory (such as microphone and headset) for radio transmission and reception. *b.* Retransmission cable when radio is set up for radio relay operation. *c.* Radio/wire (R/W) integration cable for radio transmission and reception to be controlled by remote control equipment situated at a site remote from the radio (such as AN/GSA-7).
SPKR receptacle	Connection for following functions: *a.* Audio accessory (such as microphone or headset) for radio transmission and reception). *b.* Loudspeaker for radio reception.

Control, indicator, and receptacle	Function
ANT CONT receptacle	Connection for control cable, CX-4722/VRC, to antenna matching unit. Control of antenna matching unit networks is automatic and occurs when MC control and BAND switch are positioned.
REMOTE receptacle (RT-246(*)/VRC only)	Connection for control cable to C-2742/VRC. When POWER switch is in REMOTE position, C-2742/VRC controls dc power (OFF, LOW, and HIGH), and automatic selection of frequencies set up on channel pushbuttons.
X-MODE receptacle	Connection for cable to X-mode equipment (such as telephone multiplex, secure voice, and digital data equipment) for control of radio transmission and reception by X-mode equipment. The X-MODE-NORMAL switch inside the radio must also be set to X-MODE position when X-mode operation is used. The X-MODE receptacle cover contains wiring to enable to operate when X-mode equipment is not connected to the receptacle. The X-MODE-NORMAL switch in the radio must also be set to NORMAL position.
ANT receptacle	BNC, 50-ohm impedance receptacle for antenna cable.
Power/audio receptacle (P401)	Connection to radio receptacle of MT-1029/VRC for application of dc power to the radio and for the passage of dc power and control and audio signals between the radio and equipment connected to the MT-1029/VRC.
	(Following pushbutton controls are provided on RT-246(*)/VRC only.)
Pushbuttons, 1 through 10	Each channel pushbutton, when pushed in, disengages all other pushbuttons and activates the internal motor mechanism to tune the radio to a preset frequency. The preset frequency is set during the adjustment of the following band selector and preset control. The MC, KC, and BAND controls also move when the preset mechanism is activated by a pushbutton. The following controls function as indicated after the BAND switch is set to AUTO and one of the channel pushbuttons (1 through 10) is pushed in. The operation provides a preset frequency for each pushbutton.
TUNE button (nonlocking)	When depressed, engages the automatic tuning circuits while the preset control (below) of the particular pushbutton is adjusted for the desired frequency.
Band selector switch (1 for each channel)	Selects tuning of frequency band A or B circuits.
Preset control (1 for each channel)	With TUNE button pressed, adjusts frequency tuning circuit until desired frequency is seen in dial window.

3-3. Receiver-Transmitter, Radio RT-524(*)/VRC, Controls, Indicators, and Receptacles (fig. 3-3)

Refer to paragraph 3-2 for description of the controls indicators, and receptacles of the RT-524(*)/VRC which are the same as those for the RT-246(*)/VRC except for the SPKR switch and the pushbutton controls.

3-4. Receiver, Radio R-442(*)/VRC, Controls, Indicators, and Receptacles (fig. 3-4)

Control, indicator, and receptacle	Function
LAMP holder	Holds the dial lamp.
BAND switch	Selects tuning of frequency band A (30.00 to 52.95 MHz) or B (53.00 to 75.95 MHz).
Squelch CALL indicator	During squelch operation, lights to indicate signal is received, when LIGHT switch is ON and SQUELCH switch is in NEW ON or OLD ON.
LIGHT switch	Controls dc power to dial window lamp and squelch CALL indicator.

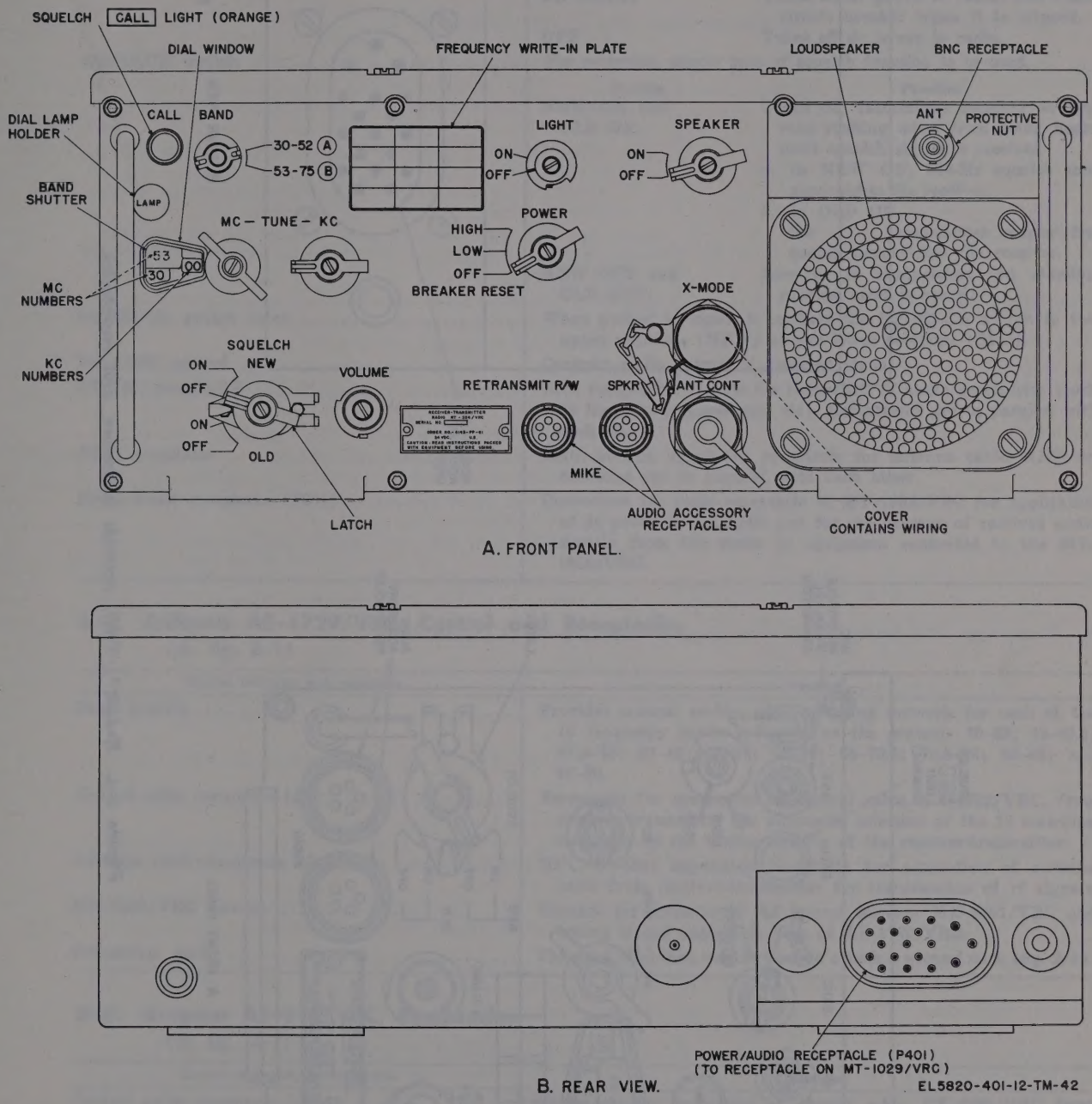


Figure 3-3. RT-524(*)/VRC, controls, indicators, and receptacles.

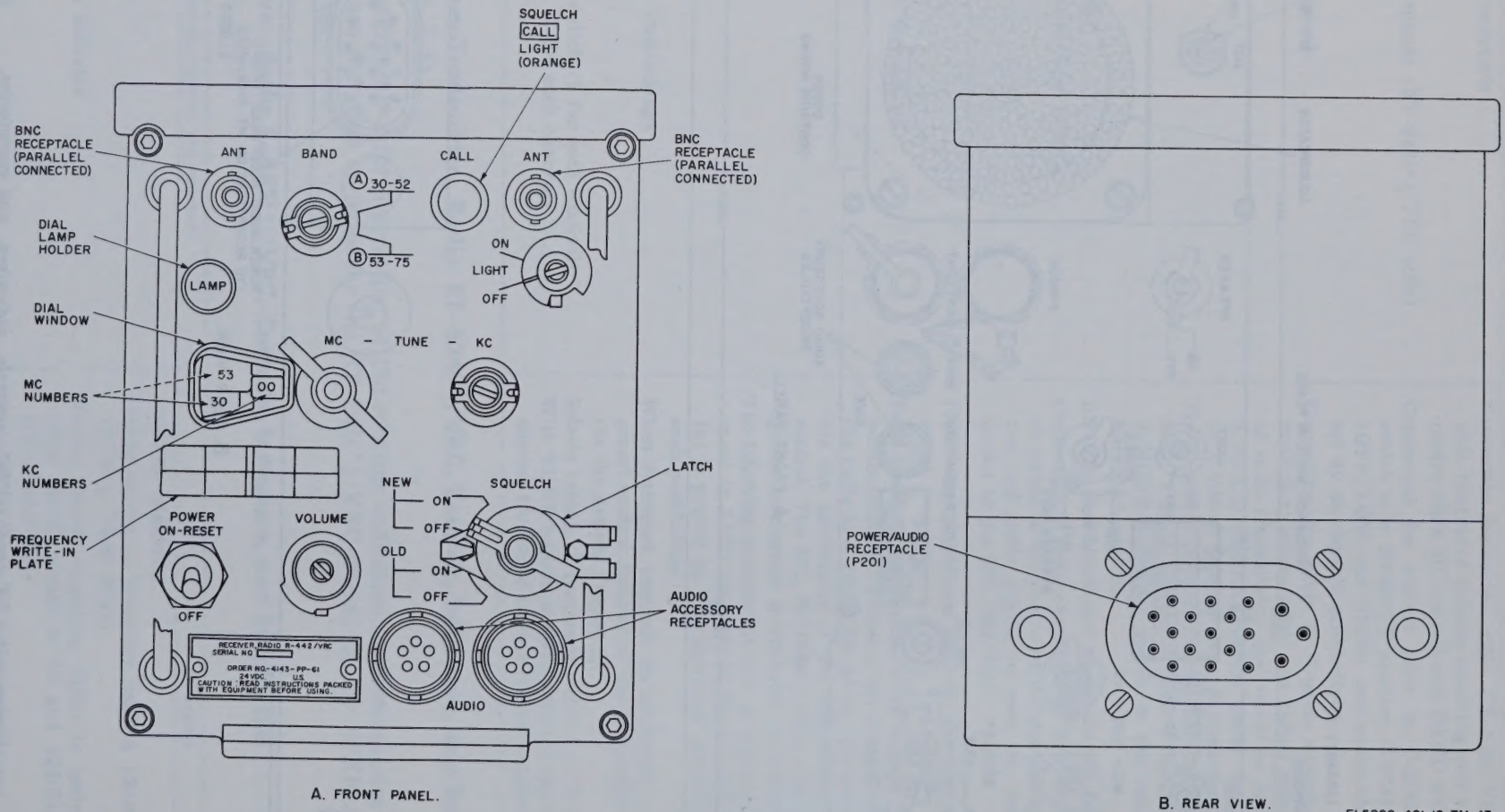


Figure 3-4. R-442(*)/VRC, controls indicators, and receptacles.

Control, indicator, and receptacle	Function
MC tuning control	Provides manual tuning of radio in 1-MHz steps (30, 31, 53, 54, etc).
KC tuning control	Provides manual tuning of radio in 0.05-MHz steps (00, 05, 10, 15, etc).
POWER switch	Controls dc power to radio. *Position* — *Function* ON-RESET — Turns on dc power to radio; and resets circuit breaker when it is tripped. OFF — Turns off dc power to radio.
SQUELCH switch	For reception, selects type of squelch function to be used. *Position* — *Function* NEW ON and OLD ON. — Turns off (squelches) receiver to prevent rushing noise from being heard until squelch signal is received. *a.* In NEW ON, 150-Hz squelch tone unsquelches the receiver. *b.* In OLD ON, the transmitter carrier frequency unsquelches the receiver. NEW OFF and OLD OFF. — Receiver is unsquelched (on standby, rushing noise is heard).
SQUELCH switch latch	When pushed to right, it confines the SQUELCH switch to two upper positions (NEW) or two lower positions (OLD).
VOLUME control	Controls audio output of received signal.
AUDIO receptacles	Both receptacles provide for connection of audio accessories (such as headsets loudspeakers, etc). Receptacles are in parallel with each other.
ANT receptacle	BNC, 50-ohm impedance receptacle for antenna cable. ANT receptacles are in parallel with each other.
Power/audio receptacle (P201)	Connection for radio receptacle of MT–1898/VRC for application of dc power to the radio and for the passage of received audio signals from the radio to equipment connected to the MT–1898/VRC.

3–5. Antenna AS–1729/VRC, Control and Receptacles
(A, fig. 2–1)

Control, indicator, and receptacle	Function
Band control	Provides manual section of a matching network for each of the 10 frequency bands indicated on the control: 30–33; 42–47.5; 47.4–53; 37–42; 33–37; 53–56; 65–70.5; 70.5–76; 60–65; and 56–60.
Control cable receptacle (J2)	Receptacle for connection of control cable, CX–4722/VRC, from receiver-transmitter for automatic selection of the 10 matching networks by the tuning circuits of the receiver-transmitter.
Antenna cable receptacle (J1)	BNC, 50-ohm impedance receptacle for connection of antenna cable from receiver-transmitter for transmission of rf signals.
MX–6707/VRC contact	Contact for transfer of RF power between MX–6707/VRC and spring loaded contact in base of AS–1730/VRC.
Grounding stud	Threaded stud that may be used to attach a ground wire (fig. 2–3).

3–6. Antenna AT–912/VRC, Receptacles
(B, fig. 2–1)

Control, indicator, and receptacle	Function
Control cable receptacle (J551)	Receptacle for connection of control cable, CX–4722/VRC from receiver-transmitter for automatic selection of 10 matching networks in the MX–2799/VRC by the tuning circuits of the receiver-transmitter.

Control, indicator, and receptacle	Function
Antenna cable receptacle (J552)	BNC, 50-ohm impedance receptacle for connection of antenna cable from receiver-transmitter for transmission of RF signals.
MX-2799/VRC contact	Contact for transfer of RF power between MX-2799/VRC and spring-loaded contact in base of AT-1096/VRC.
Two-conductor lead	Provides connection between the contact of the AB-719/VRC and the BNC receptacle of the MX-2799/VRC.

3-7. Mounting MT-1029/VRC, Receptacles and Power Control Link
(fig. 2-7 and B, fig. 2-9)

Receptacle and link	Function
Radio receptacle (J24)	Connection for receiver-transmitter power/audio receptacle (P401) for: *a.* Application of dc power from receptacle J21 to receiver-transmitter. *b.* Passage of dc power, and audio and keying control signals between receiver-transmitter and receptacle J22.
Main power receptacle J21	Connection for cable from dc power source (or another MT-1029/VRC) for application of dc power to receptacles J22, J23, and J24.
Audio/control/power receptacle J22	Connection for cable from radio-intercom equipment or C-2299/VRC for passage of audio and control signals between connected equipment and receptacles J21 and J24.
Power transfer receptacle J23	Connection for power cable to another MT-1029/VRC (or MT-1898/VRC) for passage of dc power from receptacles J21 and J22.
Power control link (fig. 2-11)	Controls application of dc power from receptacle J21 to receptacle J21 to receptacles J22, J23, and J24. *a.* For control of dc power by receiver-transmitter, the link is positioned between center post and E24. Dc power is applied from receptacle J21 to J24. *b.* For control of dc power by AM-1780/VRC in radio-intercom system, the link is positioned between center post and E22. Dc power is applied from receptacle J21 to J22, J23, and J24.

3-8. Mounting MT-1898/VRC, Receptacles and Power Control Link
(fig. 2-8 and B, fig. 2-10)

Control, indicator, and receptacle	Function
Radio receptacle (J14)	Connection for power/audio receptacle (P201) of R-442(*)/VRC for: *a.* Application of dc power from receptacle J11 to R-442(*)/VRC. *b.* Passage of audio and control signals between R-442(*)/VRC and receptacle J12.
Main power receptacle J11	Connection for cable from dc power source (or another MT-1898/VRC or MT-1029/VRC) for application of dc power to receptacles J13 and J14.
Audio/control receptacle J12	Connection for cable from radio-intercom system for passage of audio and control signals between the equipment and receptacle J14.
Power transfer receptacle J13	Connection for cable to another MT-1898/VRC for passage of dc power from receptacle J11.
Power control link (fig. 2-12)	Controls application of dc power from receptacle J11 to receptacles J14 and J13. *a.* For local control of dc power by R-442(*)/VRC, link is positioned between center post and E14. Dc power is applied from receptacle J11 to J14. *b.* For remote control of dc power by AM-1780/VRC, the link is positioned between center post and E12. Dc power is applied from receptacle J11 to receptacles J14 and J13.

3-9. Amplifier, Audio Frequency AM-1780/VRC, Controls, Indicators, and Receptacles (fig. 3-5)

Control, indicator, and receptacle	Function
MAIN PWR switch	Controls dc power to radio and AM-1780/VRC. *Position* — *Function* OFF — Turns dc power off. INT ONLY — Turns on dc power to PWR CKT BKR. NORM — When the power control link in MT-1029/VRC (para 3-6) is set for remote control by AM-1780/VRC, dc power is applied to receiver-transmitter through J501. When receiver-transmitter is turned on, dc power is applied to PWR CKT BKR. However, when the link in MT-1029/VRC is not set to control of power by the AM-1780/VRC, dc power at J501 is applied to PWR CKT BKR.
INT ACCENT switch	Controls relative loudness of radio signals. *Position* — *Function* OFF — Radio and intercom signals have same loudness. ON — Radio signal level is reduced while intercom signal level is unchanged.
INSTALLATION switch	Set according to the use of the AM-1780/VRC and control boxes. *Position* — *Function* RETRANS — Disconnects keying circuits between radios and control boxes. For radio retrans. oper. OTHER — Provides proper termination for radio keying and radio audio output. Used when AM-1780/VRC is connected to radios. INT ONLY — Provides path for dc power from J508. Used when AM-1780/VRC is not connected to radios.
RAD TRANS switch	Determines which crewmember control boxes can control keying of receiver-transmitters; radio reception and intercom functions are unaffected. *Position* — *Function* CDR + CREW — All crewmembers can key receiver-transmitters. CDR ONLY — Only crew commander can key receiver-transmitters. LISTENING SILENCE — Neither crew commander nor crewmembers can key receiver-transmitters.
PWR CKT BKR switch	Controls application of dc power to AM-1780/VRC circuits and the control boxes; it also provides overload protection.
POWER indicator	Indicates that power is applied when PWR CKT BKR is set to ON. When lens cap is rotated one-quarter turn counterclockwise, the light does not shine through the lens (for blackout conditions).
AUDIO INPUT binding posts	Connection for 600-ohm audio output from a radio receiver.
LINE binding posts	Connection for field wire from remotely located telephone or switchboard for communication on intercom circuit.
Receptacle J501	Connection for cable from receiver-transmitter for passage of main dc power and audio and control circuits between the radio and crewmember control boxes and also receptacle J511.
Receptacle J503	Connection for cable from a second receiver-transmitter for passage of dc power and audio and control circuits between the radio and crewmember control boxes and also receptacle J509.

Control, indicator, and receptacle	Function
Receptacle J508	Connection for cable from a second R-442(*)/VRC for passage of audio output from the receiver to crewmember control boxes. It also provides connection for a cable from a dc power source when the AM-1780/VRC is not connected to radios (INSTALLATION switch must then be set to INT ONLY).
Receptacle J510	Connection for cable from R-442(*)/VRC for passage of audio output from the receiver to crewmember control boxes.
Receptacle J509	Connection for cable from receptacle J702 of C-2299/VRC for passage of audio and control circuits between the C-2299/VRC and receiver-transmitter (connected to J503).
Receptacle J511	Connection for cable from receptacle J701 of C-2299/VRC for passage of audio and control circuits between C-2299/VRC and receiver-transmitter (connected to J501).
Receptacle J504	Connection for cable from commander's control box for passage of dc power and audio and control circuits between the commander's control box and other crewmember control boxes (connected to J505, J506, and J507).
Receptacles J505, J506, and J507	Connection for cables from crewmember control boxes for passage of dc power and audio and control circuits between each crewmember control box, the commander's control box, and all radios.

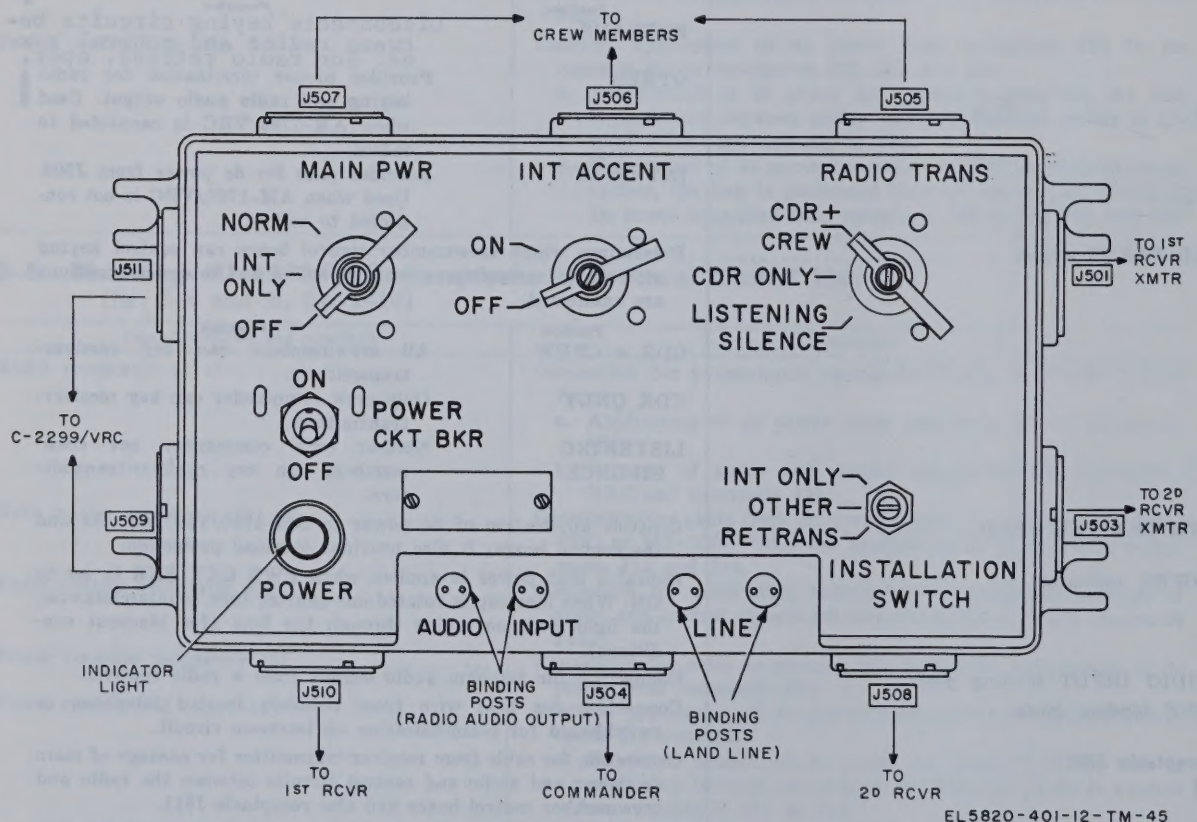


Figure 3-5. AM-1780/VRC, controls, indicator, and receptacles.

3-10. Control, Intercommunication Set C-2296/VRC, Controls, Receptacles, and Handset H-207/VRC
(fig. 3-6)

Control, receptacle, and H-207/VRC	Function
RAD TRANS-INT switch (SIG-EXT-OFF switch of C-2297/VRC must be set to EXT position before functions of C-2296/VRC can be accomplished.)	Selects operation that can be performed by H-207/VRC. *Position* — *Function* RAD TRANS (spring-loaded) — Provides communication on radio(s) selected by MONITOR switch of C-2297/VRC. INT — Provides communication on intercom circuits.
VOLUME control	Controls level of radio and intercom signals applied to H-207/VRC.
H-207/VRC	Provides two-way communication on circuit selected by RAD TRANS-INT switch. Push-to-talk switch is depressed to transmit and released to receive. Also, when the switch is depressed and the C-2297/VRC SIG-EXT-OFF switch is in OFF position, it causes the EXT lamp of C-2297/VRC to light attracting the attention of C-2297/VRC user.
LINE binding posts	Connection for field wire from remotely located telephone or switchboard to provide communication on the intercom circuit.
Receptacle J61	Connection for circuits through vehicle wiring and cables to C-2297/VRC for passage of dc power and audio and control circuits.
Receptacle J62	Connection for cable to call indicator which lights when SIG switch of C-2297/VRC is operated to SIG position.

3-11. Controls, Intercommunication Set C-2297/VRC and C-2298/VRC, Controls, Indicator, and Receptacles
(fig. 3-7 and 3-8)

Parts and functions given below apply to both control boxes unless otherwise indicated.

a. General. For the purpose of identifying the functions of the MONITOR switch of the C-2297/VRC and C-2298/VRC, the following terms have been established.

(1) "A" radio refers to the receiver-transmitter connected to J501 of the AM-1780/VRC (fig. 2-30 and 2-31).

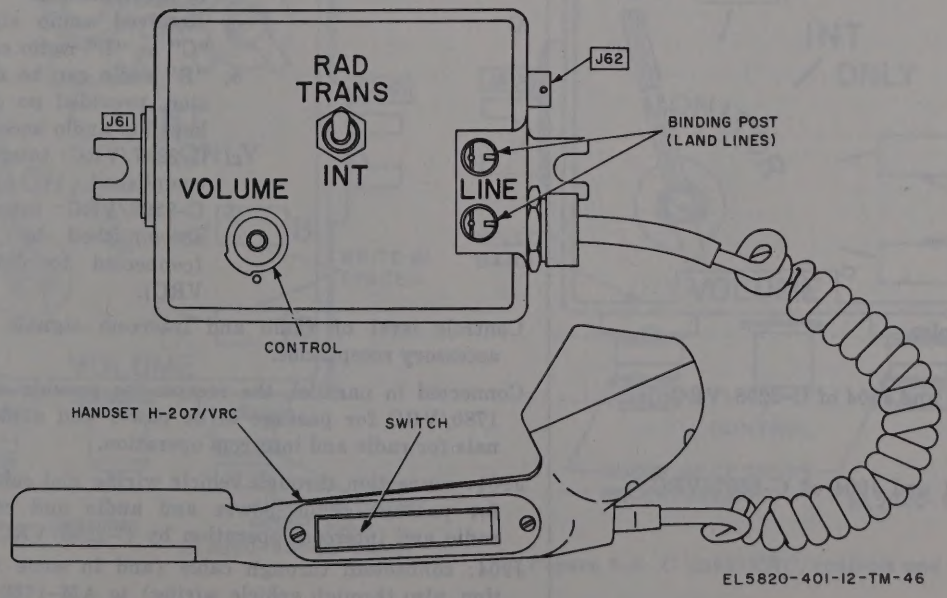


Figure 3-6. C-2296/RC, controls receptacle, and Handset H-207/VRC.

(2) "B" radio refer to the receiver-transmitter connected to J503 of the AM–1780/VRC.

(3) Receiver "B" refer to the R–442(*)/VRC connected to J510 of the AM–1780/VRC.

(4) Receiver "C" refers to the second R–442(*)/VRC connected to J508 of the AM–1780/VRC.

b. Parts Functioning.

Control, indicator, and receptacle	Function
MONITOR switch	*a.* In C–2297/VRC and C–2298/VRC, it selects the radios and intercom operation to be controlled by audio accessories connected to audio accessory receptacles. *b.* In C–2297/VRC, the switch functions are also available to the C–2296/VRC when the SIG-EXT-OFF switch is set to EXT position. *Position* — *Function* ALL — *a.* Received audio signals of "A" radio and receivers "B" and "C" can be heard. *b.* "A" radio can be used for transmission, provided no other crewmember keys his audio accessory on intercom. *c.* Talking and listening can be accomplished on intercom. A — *a.* Received audio signals of "A" radio can be heard. *b.* "A" radio can be used for transmission, provided no other crewmember keys his audio accessory on intercom. *c.* Talking and listening on intercom can be accomplished. INT ONLY — Only talking and listening on intercom can be accomplished. B — *a.* Received audio signals of receiver "B" can be heard. *b.* "A" radio can be used for transmission, provided no other crewmember keys his audio accessory on intercom. (Usually "A" radio is tuned to receiver "B" for the transmission.) *c.* Talking and listening on intercom can be accomplished. C — *a.* Received audio signals of receiver "C" or "B" radio can be heard. *b.* "B" radio can be used for transmission, provided no other crewmember keys his audio accessory on intercom. *c.* C–2297/VRC: intercom cannot be accomplished. *d.* C–2298/VRC: intercom can only be accomplished by crew commander (connected to J504 of AM–1780/VRC).
VOLUME control	Controls level of radio and intercom signals applied to audio accessory receptacles.
Receptacles J801 and J804 of C–2298/VRC	Connected in parallel, the receptacles provide connection to AM–1780/VRC for passage of dc power and audio and control signals for radio and intercom operation.
Receptacles J901 and J904 of C–2297/VRC	J901: connection through vehicle wiring and cable to C–2296/VRC for passage of dc power and audio and control signals for radio and intercom operation by C–2296/VRC. J904: connectoin through cable (and in some vehicular installation, also through vehicle wiring) to AM–1780/VRC for passage of dc power and audio and control signals for C–2297/VRC and C–2296/VRC.

Control, indicator, and receptacle	Function
Audio accessory receptacles: J803 and J802 of C–2298/VRC; J903 and J902 of C–2297/VRC.	J803 and J903 (with yellow band) provide connection for audio accessory to key, talk and listen on intercom circuit. J802 and J902 provide connection for audio accessory to key, talk, and listen on radio circuit selected by MONITOR switch.
Indicator light (C–2297/VRC)	Lights when SIG-EXT-OFF switch is set to EXT and SIG positions. When switch is set to OFF, the light will light each time the H–207/VRC push-to-talk switch of C–2296/VRC is pressed.
SIG-EXT-OFF switch (C–2297/VRC)	*Position* — *Function* SIG — Nonlocking position; causes call indicator light connected to C–2296/VRC and the indicator light of the C–2297/VRC to light. EXT — Connects radio and intercom functions of MONITOR switch to C–2296/VRC and causes indicator light to light. OFF — Disconnects C–2296/VRC from radio and intercom systems. Enables indicator light to light when H–207/VRC push-to-talk switch of C–2296/VRC is pressed.

3–12. Control, Radio Set C–2299/VRC, Controls and Receptacles
(fig. 3–9)

Control and receptacle	Function
RAD TRANS switch	Selects receiver-transmitter to be controlled by audio accessory connected to audio accessory receptacles. Position 1 selects receiver-transmitter connected to J701. Position 2 selects receiver-transmitter connected to J702.

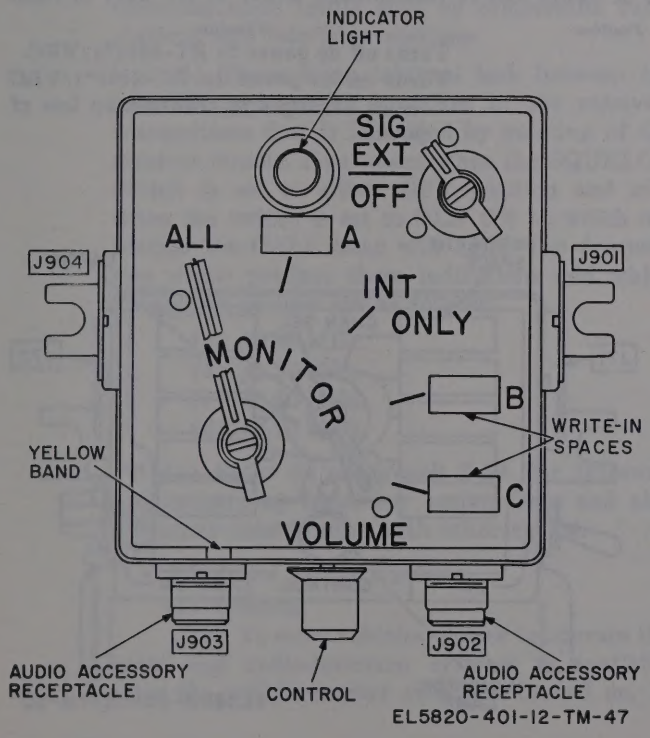


Figure 3–7. C–2297/VRC, controls, indicator, and receptacles.

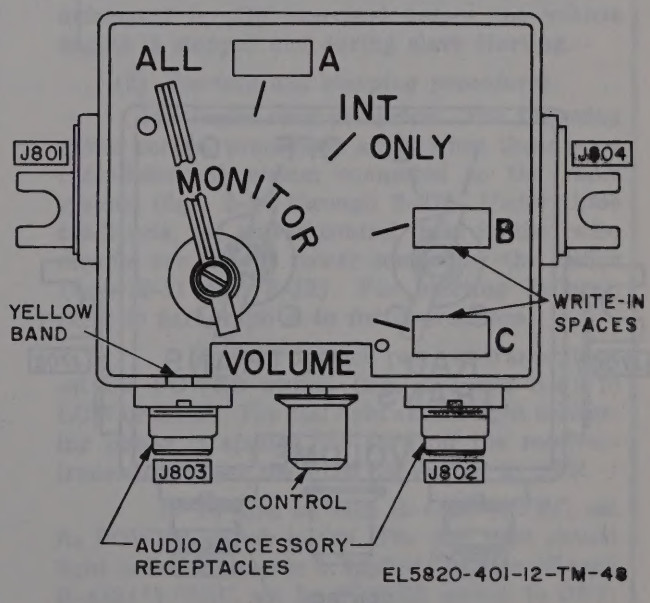


Figure 3–8. C–2298/VRC, controls and receptacles.

Control and receptacle	Function
RETRANS switch	Selects function for receiver-transmitter connected to J701 and J702. *Position* — *Function* OFF — Receiver-transmitters function independently of each other. ON — Permits automatic passage of control and audio signals between receiver-transmitters during radio retransmission operation.
VOLUME control	Controls level of audio signals applied to audio accessory receptacles.
Receptacles J703 and J704	Connection for audio accessories to talk, key, and listen to receiver-transmitter selected by RAD TRANS switch.
Receptacles J701 and J702	Connection to receiver-transmitter for passage of control and audio signals between receiver-transmitters and audio accessories. When the C-2299/VRC is connected to the AM-1780/VRC, the audio output of both receiver-transmitters is not available at the audio receptacles.

3-13. Control, Frequency Selector C-2742/VRC, Controls, Indicator, and Receptacles (fig. 3-10)

The C-2742/VRC is able to perform the circuit functions described below when the RT-246(*)/VRC pushbuttons have been set up on prescribed frequencies and the RT-246(*)/VRC POWER switch has been set to REMOTE position.

Control, indicator, and receptacle	Function
CHAN SEL switch	Ten position switch that automatically selects any one of ten frequencies that have been preset on the 10 channel pushbuttons of the RT-246(*)/VRC (fig. 3-2).
PWR SW	Controls dc power and rf transmitting power of RT-246(*)/VRC. *Position* — *Function* OFF — Turns off dc power to RT-246(*)/VRC. LO — Turns on dc power to RT-246(*)/VRC which arranges to transmit on low rf power.

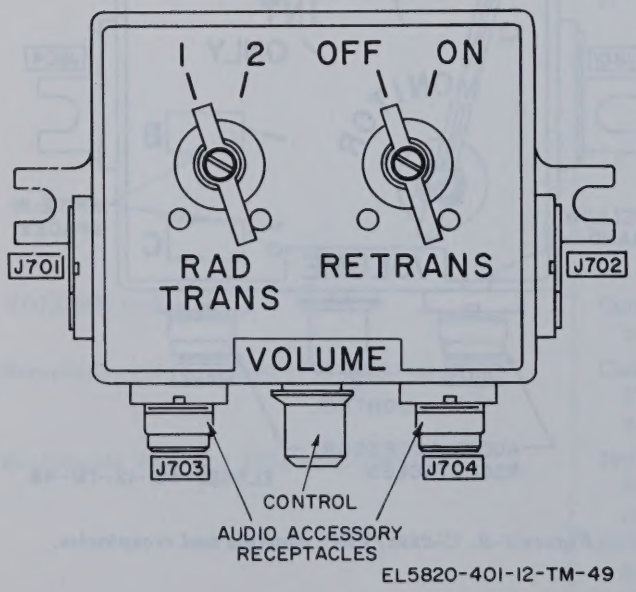


Figure 3-9. C-2299/VRC, controls and receptacles.

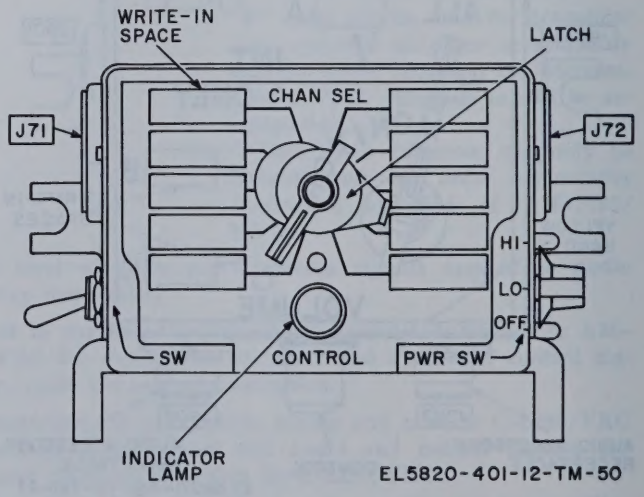


Figure 3-10. C-2742/VRC, controls, indicator, and receptacles.

Control, indicator, and receptacle	*Position*	*Function*
	HI	Turns on dc power to RT-246(*)/VRC which arranges to transmit on high rf power.
SW switch and CONTROL indicator		(Two C-2742/VRC's can be connected in tandem with each other and, in turn, connected to the RT-246(*)/VRC.) SW switch is a spring-loaded switch which, when activated, transfers the functions of the CHAN SEL and PWR switch of the other C-2742/VRC to this C-2742/VRC. When the switch is operated, the CONTROL indicator lights and the CONTROL indicator of the other C-2742/VRC goes out.
Receptacles J70 and J72		Connection for cables to RT-246(*)/VRC or another C-2742/VRC for passage of dc power and control circuits.

Section II. OPERATION OF RADIO SETS AND RADIO-INTERCOM SYSTEM EQUIPMENT

3-14. General Operating Instructions

Following are general operating instructions and some "do's" and "dont's" that should be observed by personnel using the radio sets and the radio-intercom equipment.

a. Operating Frequencies. Determine the assigned operating and alternate frequencies.

(1) The assigned frequencies or other identification may be written in the write-in plates on the equipment.

(2) Do not transmit on frequencies that have been assigned to other radio nets and to communication media such as commercial radio stations and television stations.

(3) There is an internal leak between the transmit and receive branches of the receiver-transmitters that is identified by quieting of the receiver circuit. This occurs when the SQUELCH switch is set to either OFF position and also when the switch is set to OLD ON at which operation the CALL lamp will light. The frequencies which produce these indications and which should not be usel are as follows:

(*a*) 33.90 MHz.
(*b*) 45.20 MHz.
(*c*) 56.50 MHz.
(*d*) 67.80 MHz.

(4) Refer to paragraph 2-2*b* for information concerning frequency assignments and also frequency interference with other radios.

b. Electrical Power Systems.

(1) *General.*

(*a*) In some vehicles, power to operate the radio and radio-intercom systems is available after the vehicle master switch is turned on. In other vehicles, the vehicle ignition switch does not control power to the electrical system.

(*b*) It is recommended when the vehicle is not moving, that the engine be running while the radio is being used for communication, particularly when transmitting. The engine is running at sufficient speed when the battery charge-discharge meter indicates in the charge area while the receiver-transmitter is keyed on high power.

(*c*) Observe the precautions on warning label DA Label 132: WARNING: DO NOT START VEHICLE WHILE RADIO IS ON. The label, placed near the driver's position, is issued in accordance with SB 11-624. The requirement applies to the radio ((2)(*a*) below) and to the radio-intercom system ((2)(*b*) below). The requirement is also exercised *before* the vehicle engine is stopped and during slave starting.

(2) *Starting and stopping procedures.*

(*a*) *Radio only in system.* The following power control procedures apply when there is no radio-intercom system connected to the radio system (figs. 2-20 through 2-27). Under these conditions, the power control links in the radio mounts are set for power control by the radios (figs. 2-11 and 2-12). For starting failures, refer to paragraph 4-4*a* for instructions.

1. To turn on each receiver-transmitter, set the POWER switch (figs. 3-1 and 3-3) to LOW or HIGH. The dial light should light indicating power is applied. To turn off the receiver-transmitters, set the POWER switch to OFF.

2. To turn on each R-442(*)/VRC, set its POWER switch to ON. The dial light should light indicating power is applied. To turn off each R-442(*)/VRC, set its POWER switch to OFF.

(*b*) *Radios with radio-intercom system.* Under this condition, the power control link in the radio mounts should be set for power control by the AM-1780/VRC (figs. 2-11 and 2-12); thus, power for both radios and radio-intercom system is controlled by the AM-1780/VRC (*1* below). However, the radio mount links may be positioned as explained in (*a*) above; in which case, the radios are turned on and off as explained in (*a*) *1* and *2* above, and the radio-intercom system as in *3* below.

1. To turn on all radios and radio-intercom system, set AM-1780/VRC MAIN PWR switch (fig. 3-5) to OTHER; set the POWER switch to LOW or HIGH of the receiver-transmitter connected to J501 of the AM-1780/VRC; then set AM-1780/VRC POWER CKT BKR switch to ON. When there is a second receiver-transmitter, set its POWER switch to LOW or HIGH; when there are R-442(*)/VRCs, set their POWER switches to ON.

2. To turn off all radios and radio-intercom system, set AM-1780/VRC MAIN PWR switch to OFF.

3. To turn on only the radio-intercom system, set AM-1780/VRC MAIN PWR switch to INT ONLY (the radios will be turned off thereby) and POWER CKT BKR switch to ON. To turn off the radio-intercom system, set the POWER CKT BKR and MAIN PWR switches to OFF.

c. Antennas.

(1) The whip antennas can be tied down, provided satisfactory radio communication can be conduddcted.

(2) When the control cable, CX-4722/VRC, is not connected between the receiver-transmitter and the MX-6707/VRC, manually position the band control (A, fig. 2-1) to the position that includes the operating frequency of the receiver-transmitter.

d. Operation.

(1) Use low transmitting power (with POWER switch on LOW) unless experience shows that the distant radio station cannot be contacted until high transmitting power is used. The setting of the POWER switch has no effect on receiver circuit of the receiver-transmitter.

(2) If squelch mode operation is being considered, refer to paragraph 3-16 for information on the subject.

(3) For information concerning the use of audio accessories, refer to paragraph 3-15.

(4) For tactical security, adjust the VOLUME control so that only immediate users can hear the audio output of the radio and audio accessory.

(5) Keep insulating material (particularly clothing) away from the rear and right side of the receiver-transmitters. This precaution is to insure that the air intake blower in the rear of the radio is unobstructed and that the heat exchanger surfaces are not covered by insulating material.

e. X-Mode Operation. When X-mode equipment (para 1-6*c*(6)) is used with the receiver-transmitters and R-442(*) VRC, the X-MODE-NORMAL switch inside the radio is set to X-MODE position (para 2-5*d* or 2-6*c*). The radio operating procedures in association with X-mode equipment is provided in the publication provided with the X-mode equipment.

3-15. Connections and Use of Audio Accessories

a. General. Typical audio accessories used with the radios and radio-intercom system equipment includes a microphone (such as Microphone, Dynamic M-80/U (fig. 3-12)), handsets (such as Handsets H-189/GR and H-250/U (fig. 3-11)), headsets (such as Headsets H-140A/GR and H-251/U (fig. 3-12)), headset-microphone assembly (such as Headset-Microphone H-161/U (fig. 3-12), CVC helmet (Fig. 3-14) in which an audio accessory similar to H-161/U is installed, and a loudspeaker (such as Loudspeaker LS-454/U) with which Cable Assembly, Special Purpose, Electrical CX-7867/VRC (fig. 3-13) of various lengths may be used as an extension cord.

(1) General procedures for attaching audio accessories to equipment receptacles are discussed in *c* below.

(2) Audio accessory operation is discussed in *d* below.

(3) Expressions used throughout the operating procedures concerning audio accessory operation of radios and radio-intercom system equipment are discussed in *b* below.

b. *Operating Terms.* The following expressions which are used throughout the operating procedures are defined as follows:

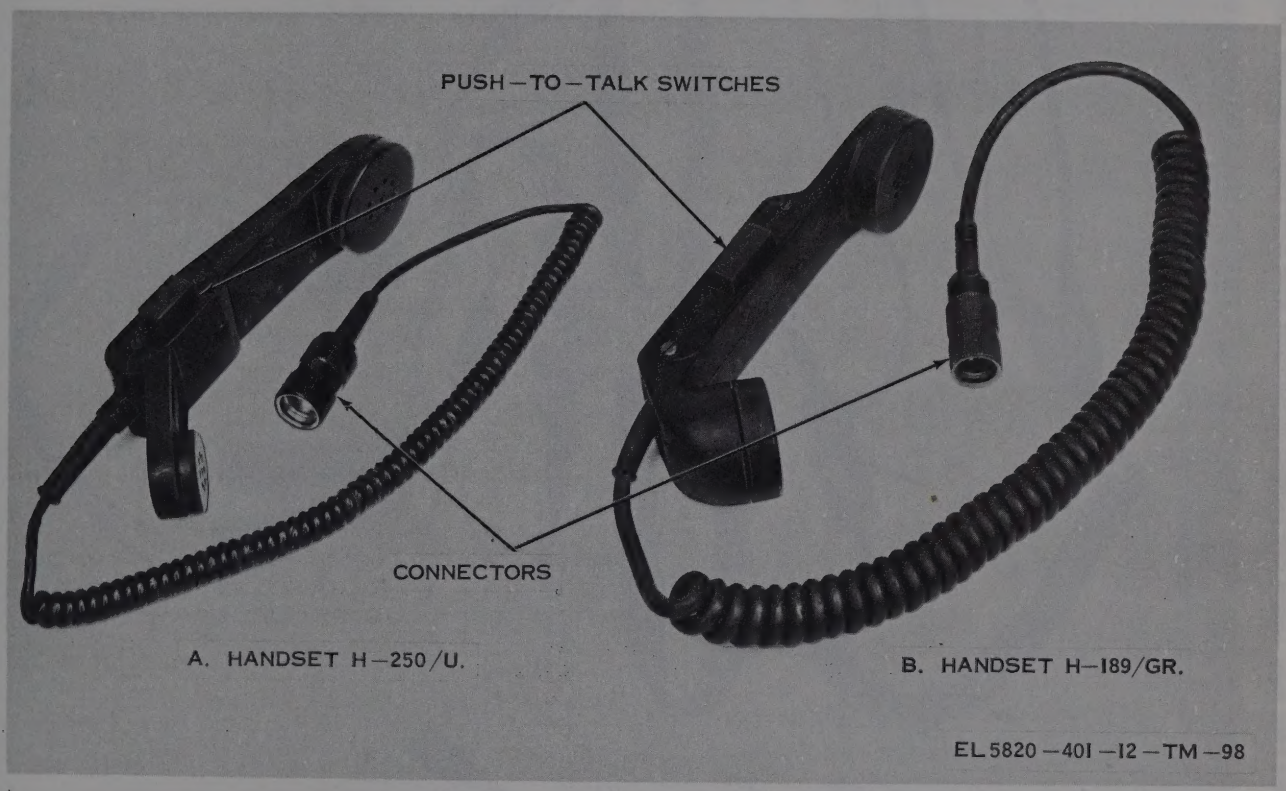


Figure 3-11. Typical handsets used with radios.

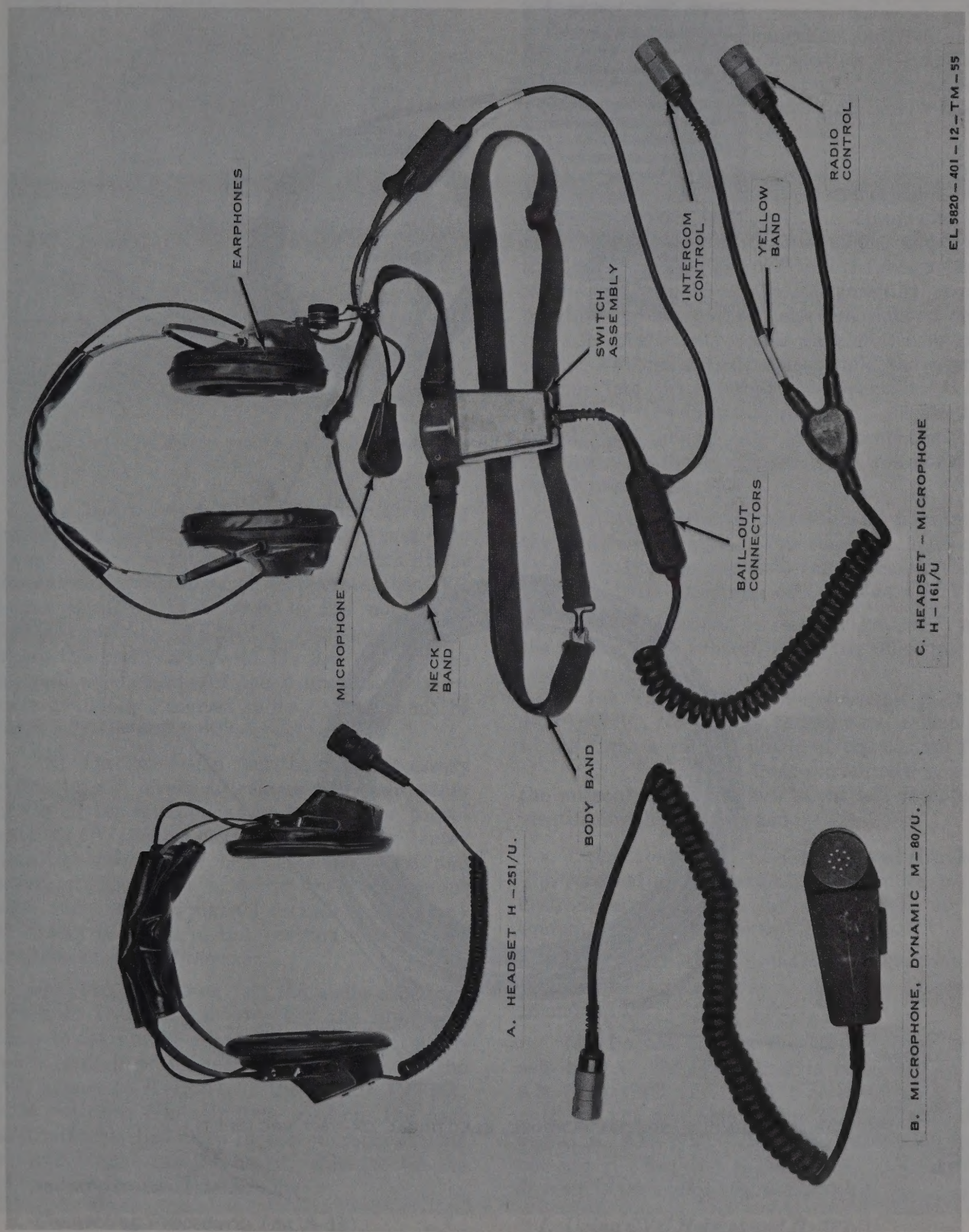


Figure 3-12. Typical microphone and headset used with radios and headset-microphone used with radio-intercom equipment.

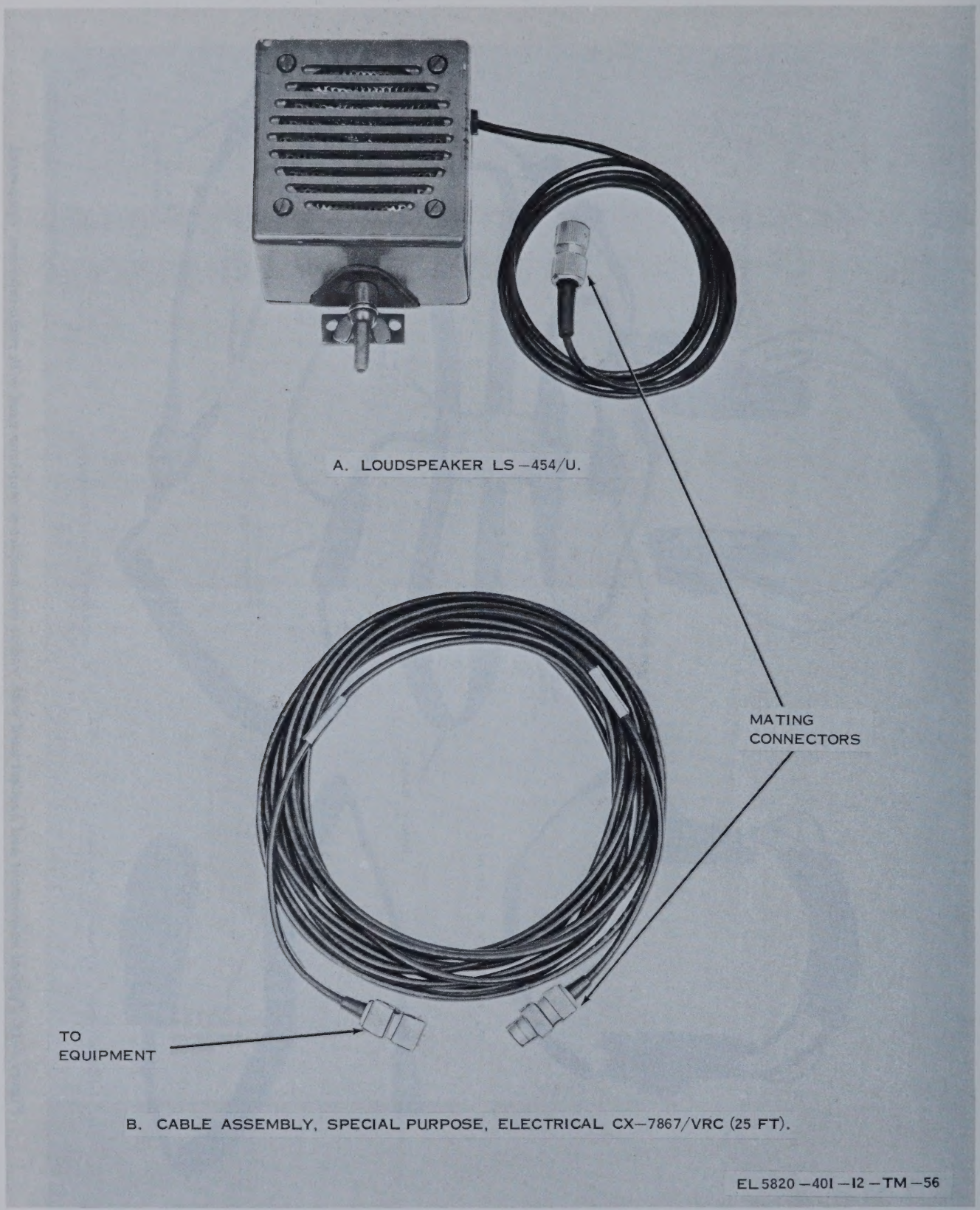


Figure 3–13. Loudspeaker LS–454/U and extension cable CX–7867/VRC used with LS–454/U.

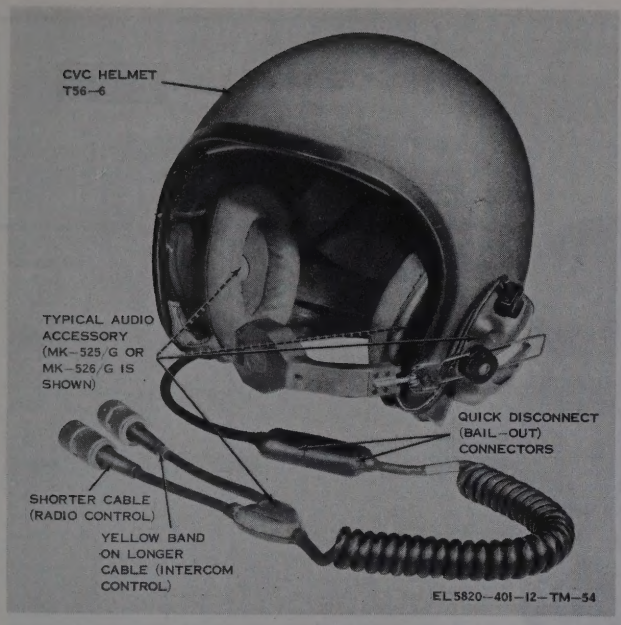

CVC HELMET T56-6
TYPICAL AUDIO ACCESSORY (MK-525/G OR MK-526/G IS SHOWN)
QUICK DISCONNECT (BAIL-OUT) CONNECTORS
SHORTER CABLE (RADIO CONTROL)
YELLOW BAND ON LONGER CABLE (INTERCOM CONTROL)
EL 5820-401-12-TM-54

Figure 3-14. CVC helmet with typical audio accessory installed.

(1) The expression "set the audio accessory switch to RADIO" or "key the radio" means to operate the nonlocking push-to-talk switch of the microphone or handset, or to operate the CVC helmet or H-161/U switch to the nonlocking RADIO position. While the switches are operated, the user talks with his lips close to the microphone; sidetone of the transmission is usually available. Received radio signal cannot be heard until the switch is released.

(2) The expression "set the audio accessory switch to off" means to release the push-to-talk switch of the microphone or handset, or to operate the CVC helmet or H-161/U switch to center (locking) position to hear received radio and intercom signals; or to await the reception of radio and intercom signals (standby operation) which can be heard in this position without any action on the part of the user.

(3) The expression "set the audio accessory switch to INTERCOM" or "key the intercom" means to operate the microphone or handset push-to-talk switch or to operate the switch on the CVC helmet or H-161/U to the locking INTERCOM position. While in this position, the user talks with his lips close to the microphone; the received signal can be heard; sidetone of the transmission is usually available.

c. Connecting Procedures (fig. 3-15).

(1) Insert the connector of the audio accessory into the audio receptacle on the equipment with the flat surface in line with the receptacle key, push and twist the connector until it locks onto the receptacle.

(2) To facilitate connection and removal of the connector, put a light coating of insulating silicon compound on the O-ring of the connector (fig. 2-19), or dampen the O-ring before inserting it on the equipment receptacle.

d. Using Microphone and Handsets. Typical handsets are provided with a microphone, earphone, and push-to-talk switch. Microphone M-80/U is provided with a microphone and push-to-talk switch. The M-80/U and the microphones of the handsets have a noise-cancelling circuit, provided by a separate noise microphone opening behind the microphone that effectively cancels or reduces outside noise while the user is talking into the microphone. Operating is accomplished by operating the push-to-talk switch and talking into the microphone with the lips close the mouthpiece, and releasing the switch to hear the reply.

(1) Attach the microphone and handset to the equipment receptacles as shown in figures 3-16 and 3-17. The handsets can be connected to either AUDIO receptacle of the R-442(*)/VRC.

(2) When audio accessories are used with the crewmember control boxes, the following operations apply:

(*a*) To use the receiver-transmitter or R-442(*)/VRC, connect the microphone or handset to the right audio receptacle of the control box.

(*b*) To use the intercom circuit, connect the microphone or handset to the left receptacle, identified with a yellow band.

e. Using Loudspeaker LS-454/U and Headsets. The received audio signals are controlled to the desired listening level by adjustment of the equipment VOLUME control.

(1) Attach the LS-454/U and headsets to the equipment receptacles as shown in figures 3-16 and 3-17.

(2) Do not connect the LS-454/U or headsets to a C-2299/VRC that is connected to the AM-1780/VRC (fig. 2-35); received radio signals are not available at the C-2299/VRC connected to AM-1780/VRC. This restriction does not apply when the C-2299/VRC is connected directly to the radios (fig. 2-27).

f. Using CVC Helmet and H-161/U.

(1) The switch on the audio accessory on the CVC helmet and H-161/U has three positions:

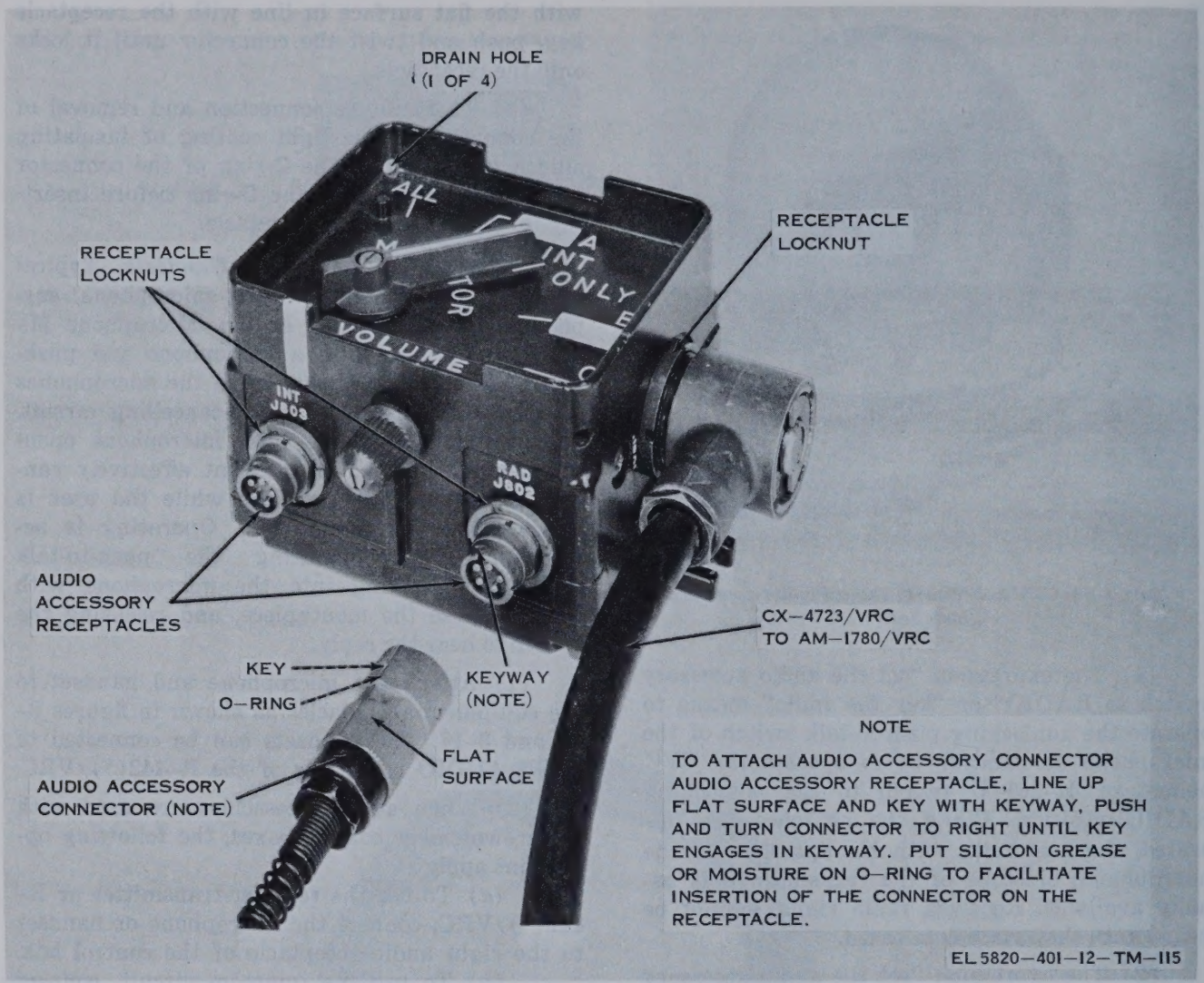


Figure 3-15. C-2298/VRC, cable and audio accessory connections.

(*a*) The forward, nonlocking position (marked RAD on H-161/U) is defined as the "RADIO position" in these operating instructions. The position is used for radio transmission; the transmitter is keyed and sidetone of the transmission heard.

(*b*) The rearward, locking position (marked I C S (intercom system) on H-161/U) is identified as the INTERCOM position in these operating procedures. The position is used for intercom transmission; the intercom is keyed, sidetone of the transmission is heard, and intercom and radio signals can be heard.

(*c*) The locking midposition disconnects the keying and microphone functions of the RADIO and INTERCOM positions and permits radio and intercom signals to be heard.

(2) Of the two connectors used to connect the audio accessory to the equipment, one is attached to a longer cord which is identified with a yellow band. The connector contains the keying control for the intercom circuit. The other connector, attached to the shorter cord, contains the keying control for the radio circuit and the microphone and earphone circuits for both radio and intercom operation.

(3) On the C-2297/VRC, C-2298/VRC, and C-2299/VRC, attach the audio accessory as shown in figure 3-17. Set the audio accessory switch in accordance with the functions desired as given in (1) above. However, since received radio signals are not available at a C-2299/VRC connected to the AM-1780/VRC, the only function the CVC helmet and H-161/U can accom-

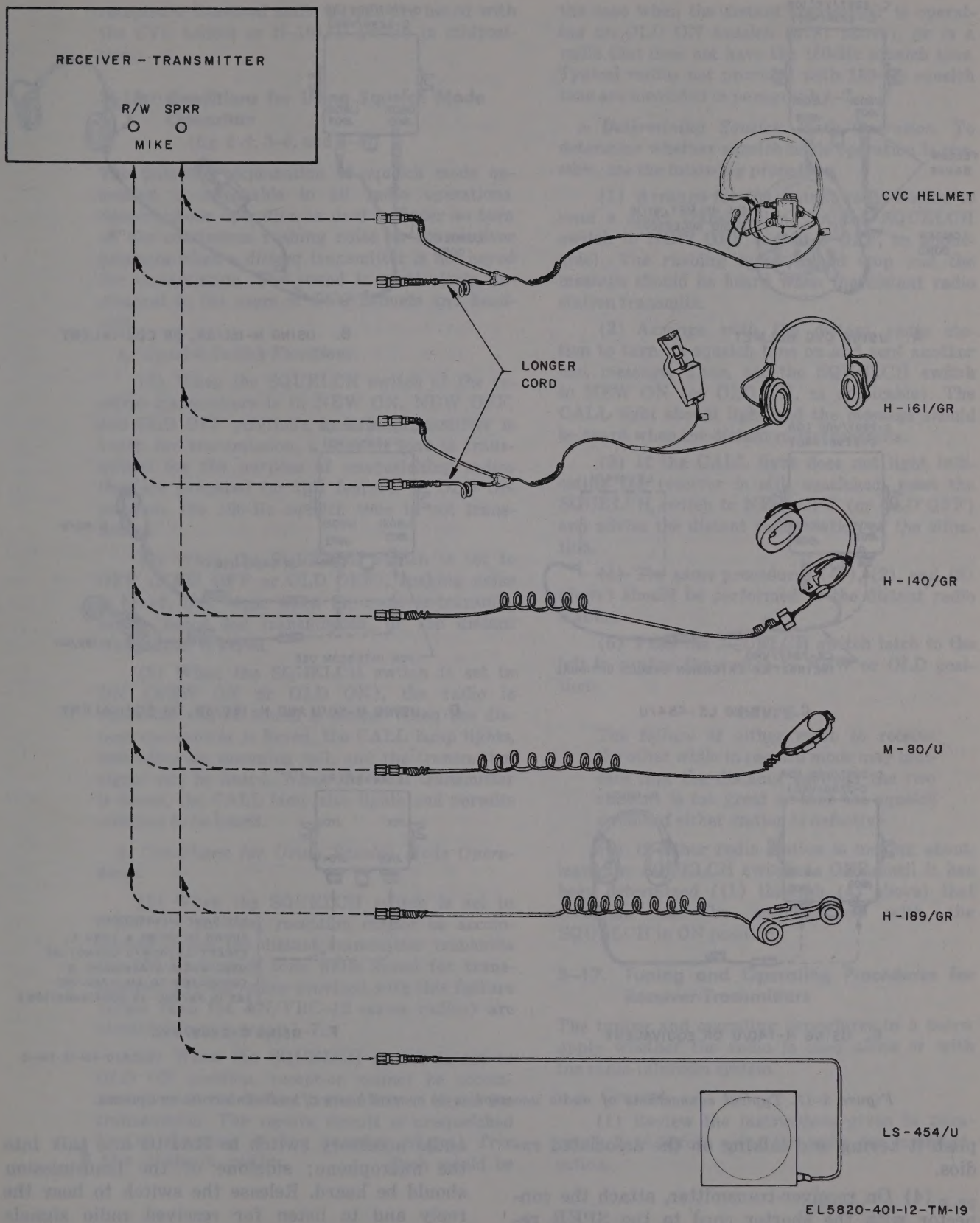


Figure 3-16. Typical connections of audio accessories to receiver-transmitter.

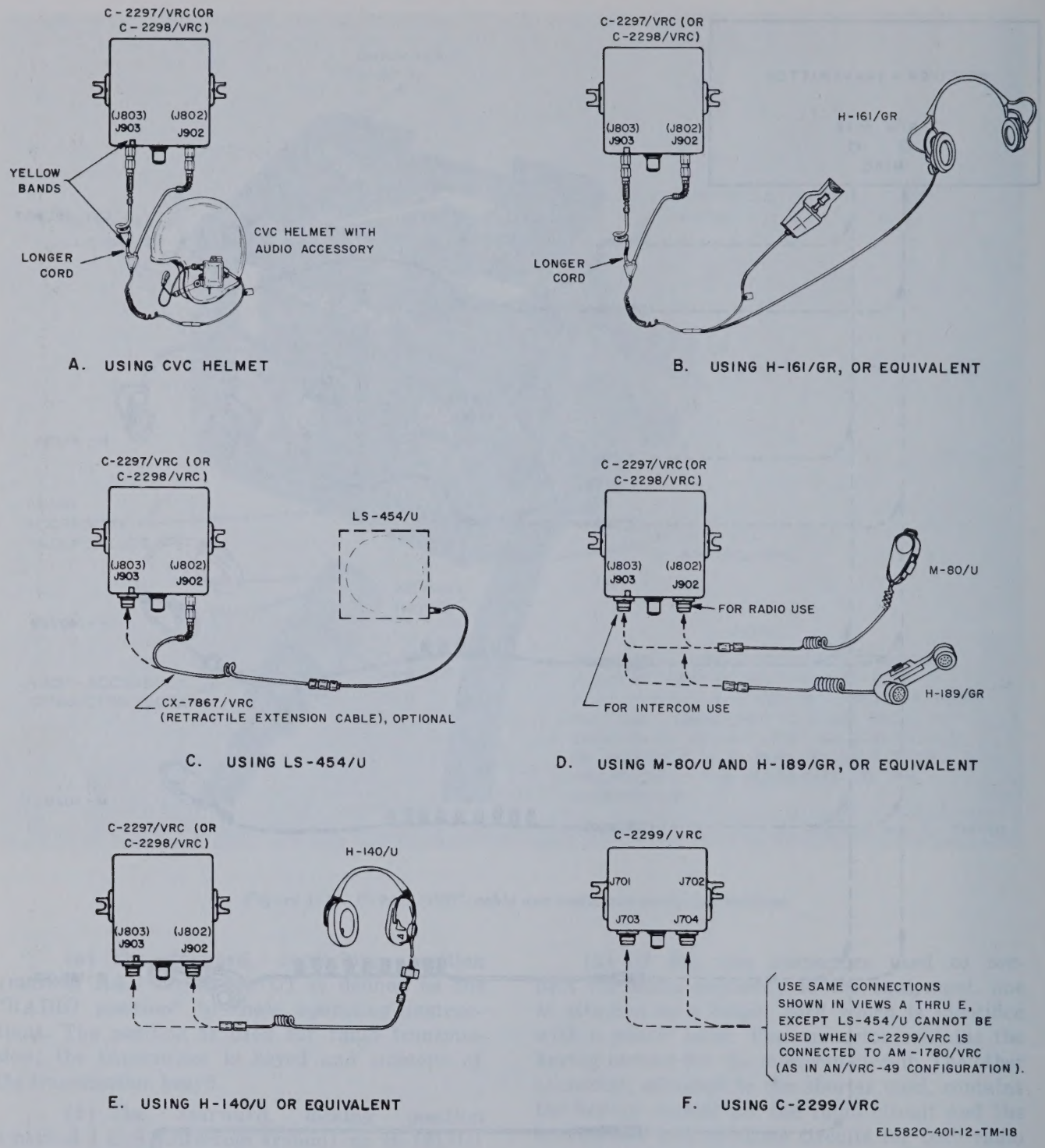


Figure 3-17. Typical connections of audio accessories to control boxes of radio-intercom equipment.

plish it keying and talking on the associated radios.

(4) On receiver-transmitter, attach the connector with the shorter cord to the SPKR receptacle (fig. 3-16); for convenience, attach the longer cord connector to RETRANS R/W receptacle. To communicate on the radio, set the audio accessory switch to RADIO and talk into the microphone; sidetone of the transmission should be heard. Release the switch to hear the reply and to listen for received radio signals (standby).

(5) In the R-442(*)/VRC, attach the connector with the shorter cord to either AUDIO

receptacle. Received audio signals are heard with the CVC helmet or H-161/U switch in midposition.

3-16. Conditions for Using Squelch Mode Operation

(fig. 3-1, 3-3, and 3-4)

The following explanation of squelch mode operation is applicable to all radio operations. Squelch mode operation is used in order to turn off the continuous rushing noise an fm receiver produces when a distant transmitter is not keyed for transmission. The sound is particularly unpleasant to the users of CVC helmets and headsets.

a. Squelch Switch Functions.

(1) When the SQUELCH switch of the receiver-transmitters is in NEW ON, NEW OFF, and OLD OFF positions, and the transmitter is keyed for transmission, a squelch tone is transmitted for the purpose of unsquelching radios that are prepared for this feature. In OLD ON position, the 150-Hz squelch tone is not transmitted.

(2) When the SQUELCH switch is set to OFF (NEW OFF or OLD OFF), rushing noise is heard, then stops when the receiver-transmitter is keyed for transmission, or the distant transmitter is keyed.

(3) When the SQUELCH switch is set to ON (NEW ON or OLD ON), the radio is squelched and no sound is heard. When the distant transmitter is keyed, the CALL lamp lights, indicating an incoming call, and the transmitted signal can be heard. When the local transmitter is keyed, the CALL lamp also lights and permits sidetone to be heard.

b. Conditions for Using Squelch Mode Operation.

(1) When the SQUELCH switch is set to NEW ON position, reception cannot be accomplished unless the distant transmitter transmits the 150-Hz squelch tone while keyed for transmission. Typical radios provided with this feature (other than the AN/VRC-12 series radios) are identified in paragraph 1-7.

(2) When the SQUELCH switch is set to OLD ON position, reception cannot be accomplished until the distant transmitter is keyed for transmission. The receive circuit is unsquelched by the reception of the carrier signal from the distant radio. Such would be the case when the distant transmitter is operating on OLD ON squelch (*a*(3) above), or is a radio that does not have the 150-Hz squelch tone. Typical radios not provided with 150-Hz squelch tone are identified in paragraph 1-7.

c. Determining Squelch Mode Operation. To determine whether squelch mode operation is possible, use the following procedure.

(1) Arrange for the distant radio station to send a short transmission. Set the SQUELCH switch to NEW OFF (or OLD OFF, as applicable). The rushing noise should stop and the message should be heard when the distant radio station transmits.

(2) Arrange with the distant radio station to turn its squelch tone on and sent another test message. Then, set the SQUELCH switch to NEW ON (or OLD ON, as applicable). The CALL light should light and the message should be heard when the distant radio transmits.

(3) If the CALL light does not light indicating the receiver is still squelched, reset the SQUELCH switch to NEW OFF (or OLD OFF) and advise the distant radio station of the situation.

(4) The same procedures ((1), (2), and (3) above) should be performed at the distant radio station.

(5) Push the SQUELCH switch latch to the left to confine the switch to NEW or OLD positions.

NOTE

The failure of either radio to receive the other while in squelch mode may indicate that the distance between the two stations is too great or that the squelch circuit of either station is defective.

(6) If either radio station is moving about, leave the SQUELCH switch to OFF until it has been determined ((1) through (4) above) that reception can be accomplished with the SQUELCH in ON position.

3-17. Tuning and Operating Procedures for Receiver-Transmitters

The tuning and operating procedures in *b* below apply whether the radio is used alone or with the radio-intercom system.

a. General.

(1) Review the instructions given in paragraph 3-14 before using the radio for communication.

(2) Refer to paragraph 3-15 for instructions on the use of audio accessories connected to the receiver-transmitter.

(3) After the radio is turned on and tuned to the assigned operating frequency, it is ready for radio communication, controlled by the operator using appropriate audio accessories.

(4) The RT-246(*)/VRC cannot be tuned automatically or change bands until the radio has been turned on.

CAUTION

In some original units of the RT-524/VRC, the KC control cannot be turned beyond the limits of 00 and 95 positions. To prevent damage to the control mechanisms of these units, be careful not to turn the KC control beyond the 00 and 95 positions.

b. Tuning Radio (fig. 3-1, 3-2, and 3-3).

(1) Set the POWER switch to LOW.

(2) Set the LIGHT switch to ON to illuminate the dial window and enable the CALL indicator to light during squelch operation. For blackout conditions, the switch is set to OFF.

(3) Set the SQUELCH switch to ON for squelch mode operation or to OFF when squelch operation is not required (para 3-16).

(4) Tune the radio to the desired frequency either manually ((*a*) below) or by using the pushbuttons ((*b*) below).

(*a*) To tune the radio manually, set the BAND switch to the position that includes the assigned operating frequency. Turn the MC control until the desired MHz number appears in the dial window; it should be set with a slight detent action. Turn the KC control until the desired KHz section of the assigned frequency appears in the dial window; it should be set with a slight detent action.

(*b*) To tune the RT-246/VRC to the assigned frequency, using pushbuttons, proceed as follows. If the pushbuttons have not been set up on the assigned frequencies, refer to *d* below for the procedures.

1. Set the BAND switch to AUTO.

2. Depress the pushbutton with the assigned frequency. To change to another frequency, depress the pushbutton that has been set up on that frequency.

3. Each time the pushbutton is depressed, wait for the tuning mechanism to stop operating before using the radio for transmission.

(5) To change operating frequencies, repeat the procedures in (4) above.

(6) To use the radio for communication, use the procedures in *c* below.

c. Using Radio for Communication.

(1) Turn on the radio and tune to the assigned frequency (*b* above). To use loudspeaker on RT-524(*)/VRC, set SPKR switch to ON.

(2) To use the radio for communication with the audio accessories connected to the front panel audio accessories (fig. 3-16; para 3-15), proceed as follows:

(*a*) Key the radio and speak into the audio accessory microphone. As long as the push-to-talk switch is depressed, the blower motor should be heard running. Sidetone of the transmission should be heard.

(*b*) Release the push-to-talk switch to hear the reply. Adjust the VOLUME control for comfortable listening level.

(3) To use the radio for communication controlled by the audio accessories connected to the radio-intercom system, refer to paragraph 3-20. Signals transmitted by and received for the radio-intercom system are available to audio accessories connected to the MIKE receptacles of the radio.

(4) If squelch operation is desired (para 3-16), set the SQUELCH switch to NEW ON (or OLD ON, as appropriate).

(5) When it has been determined that communication cannot be conducted with low power transmission, set the POWER switch to HIGH. (The position of the switch has no effect on received radio signals.)

(6) To turn off the radio, set the POWER switch to OFF. The dial light will go out.

(*a*) However, if the radio is used with the radio-intercom system, this will turn off the radio-intercom system and the other receiver-transmitter or R-442(*)/VRC's that may be in the radio system.

(*b*) If the radio is part of the radio-intercom system, set the MAIN PWR switch on the AM-1780/VRC to OFF to turn off the radio and the radio-intercom system. To keep the radio-intercom system operative for intercom operation, set the AM-1780/VRC MAIN PWR switch to INT ONLY and PWR CKT BKR to ON.

(7) To turn on the radio after it stops operating during use, set the POWER switch to OFF-RESET position, then back to LOW or HIGH position. If this operation is ineffective, refer to the operator troubleshooting procedures (para 4–4 and 4–5).

(8) For procedures to operate the RT–246(*)/VRC with the C–2742/VRC, refer to paragraph 3–18.

(9) For procedures to operate the radio with the C–2299/VRC, refer to paragraph 3–21.

d. Presetting RT–246(*)/VRC Pushbuttons. The channel pushbuttons can be used to tune the RT–246(*)/VRC to an assigned frequency instead of manually changing the MC and KC controls. Also, before the C–2742/VRC can be used to remotely tune the RT–246(*)/VRC, the pushbuttons must be set up on the desired frequencies. Use the following procedures to set up each pushbutton to the desired frequency.

(1) Open the hinged cover of the pushbuttons (fig. 3–2).

(2) Set the BAND switch to AUTO (The BAND switch will not function in A, B, or AUTO position unless the radio is turned on.)

(3) Depress the pushbutton on which the desired frequency is to be set up.

(4) Turn the band selector to the position (A or B) that includes the desired frequency.

(5) Hold the TUNE pushbutton depressed and rotate the preset control until the desired frequency appears in the center of the dial window. The movement of the preset control is accompanied by the simultaneous movement of the MC and KC controls.

(6) Check the setting of the automatic mechanism by depressing another pushbutton, wait for the new frequency to be set up, then depress the original pushbutton. The required frequency should be set up exactly in the dial window; if not, repeat the tuning procedure ((5) above).

(7) Close the hinged cover on the pushbutton adjustment controls.

(8) To use the pushbuttons to change operating frequencies, refer to *b*(4)(*b*) above.

3–18. Operating C–2742/VRC with RT–246(*)/VRC

The C–2742/VRC provides a means of remotely controlling the output RF power and changing frequencies of the RT–246(*)/VRC. Usually, there are two C–2742/VRC's located at different crewmember position in some vehicles (fig. 2–28 through 2–31). Use the following procedures to operate the RT–246(*)/VRC through the C–2742/VRC.

a. Set the RT–246(*)/VRC POWER switch to LOW and the BAND switch to AUTO.

b. Tune the pushbuttons to the desired frequencies. Refer to paragraph 3–17*d* for the procedures.

c. After satisfactory operation of the pushbuttons, set the POWER switch to REMOTE. This action transfers control of power and frequency-changing to the C–2742/VRC.

d. On the C–2742/VRC, momentarily push the SW toggle switch. When there are two C–2742/VRC's, push the toggle switch on the one that desires control of the RT–246(*)/VRC. The CONTROL indicator on the C–2742/VRC should light, indicating it has control of the radio. On the second C–2742/VRC, its CONTROL indicator should go out.

e. To change the transmitting power of the RT–246(*)/VRC, set the C–2742/VRC PWR switch to LO or HI, as desired. The mechanism in the RT–246(*)/VRC will make the change.

f. To change operating frequencies, rotate the C–2742/VRC CHAN SEL switch to the position that has been assigned the frequency. Wait until the mechanism in the RT–246(*)/VRC has stopped operating before using the radio for transmission.

NOTE

Counterclockwise position 1 of the CHAN SEL switch corresponds to pushbutton 1 on the RT–246(*)/VRC; position 2 to pushbutton 2; position 3 to pushbutton 3; etc.

g. To turn off the RT–246(*)/VRC, set the C–2742/VRC PWR switch to OFF. The CONTROL indicator should go out as well as the dial light in the RT–246(*)/VRC.

h. To turn on the RT–246(*)/VRC, set the C–2742/VRC PWR switch to ON.

i. However, when there are two C–2742/VRC's in the system, the RT–246(*)/VRC can be turned on and off only by the one that is connected directly to the RT–246(*)/VRC (through cable CX–7059/VRC (fig. 2–28 through 2–31)).

j. To return control to the RT-246(*)/VRC, set the RT-246(*)/VRC POWER switch to LOW or HIGH, as desired. The CONTROL indicator on the C-2742/VRC should go out.

3-19. Tuning and Operating Procedures for R-442(*)/VRC

(fig. 3-4)

The tuning and operating procedures in *b* below apply whether the R-442(*)/VRC is used alone or with the radio-intercom system.

a. General.

(1) Review the instructions given in paragraph 3-14 before using the R-442(*)/VRC for communication.

(2) After the R-442(*)/VRC is turned on and tuned to the assigned operating frequency, it is ready for radio reception.

(3) Refer to paragraph 3-15 for instruction on the use of audio accessories connected to the R-442(*)/VRC.

b. Operating R-442(*)/VRC.

(1) Set the POWER switch to ON-RESET.

(2) Set the LIGHT switch to ON to illuminate the dial window and enable the CALL indicator to light during squelch reception. For blackout conditions, the switch is set to OFF.

(3) Set the SQUELCH switch to ON for squelch mode operation or OFF when squelch operation is not required (para 3-16).

(4) Tune the R-442(*)/VRC to the assigned frequency as follows.

(*a*) Set the BAND switch to the position (A or B) that includes the assigned operating frequency.

(*b*) Turn the MC control until the MHz number appears in the dial window; it should be set with a slight detent action.

(*c*) Turn the KC control until the kHz section of the frequency appears in the dial window; it should be set with a slight detent action.

(*d*) To change frequency of operation, repeat the procedures in (*a*), (*b*), and (*c*).

(5) During the reception of signals, adjust the VOLUME control for comfortable listening level.

(6) To communicate with the distant transmitter, tune the associated receiver-transmitter to the R-442(*)/VRC frequency (para 3-17*b* and *c*). During the transmission, when the loudspeaker is connected to the R-442(*)/VRC, the receiver-transmitter controls the level of the signal received on the R-442(*)/VRC by muting it. This prevents acoustic feedback from the loudspeaker to the transmitter microphone.

(7) Signals received by the R-442(*)/VRC are available to the radio-intercom system (para 3-20).

(8) To turn off the R-442(*)/VRC, set the POWER switch to OFF.

(9) To turn on the R-442(*)/VRC after it stops operating during use, set the POWER switch to ON-RESET. If this operation is ineffective, refer to the operator troubleshooting procedures (para 4-4 and 4-5).

3-20. Operation of Radio-Intercom System (AM-1780/VRC and Crewmember Control Boxes) for Radio and Intercom Control

(fig. 2-28 through 2-35)

The radio-intercom system includes the AM-1780/VRC and the crewmember control boxes, C-2298/VRC, C-2297/VRC, and C-2296/VRC. In some vehicles, two, three, or four C-2298/VRC's are provided; in other vehicles, the C-2297/VRC (for the driver) and C-2296/VRC (installed outside the vehicle) are also provided.

NOTE

The designations "A", "B", and "C" applied to the radios in figures 2-28 through 2-35 are based in the radio controlled by the positions of the MONITOR switches on the control boxes in the radio-intercom system.

a. General Operating Activities.

(1) Refer to paragraph 3-15 for information on connections and operating procedures of audio accessories used by crewmembers.

(2) Before using the radios for communication, they must be turned on and tuned to the operating frequency. The tuning procedures for the receiver-transmitters are contained in paragraphs 3-17 and 3-18 and for the R-442(*)/VRC, in paragraph 3-19.

(3) During initial contact with the distant radio stations, the audio accessories can be connected directly to the radios (fig. 3-16) or they can be connected to a control box.

(4) In general, the following actions and indications occur when the crew command and the

crewmembers are involved in radio and intercom operations.

(*a*) When the crew commander is talking on a radio (audio accessory keyed for radio transmission), another crewmember cannot break the connection by using intercom. They can hear the received signal when the crew commander is not keyed for transmission. Sidetone of the radio transmission is heard by the crew commander.

(*b*) When a crewmember, other than the crew commander is talking on the radio and another crewmember or the crew commander keys on intercom, the radio transmission is broken. Sidetone of the radio transmission is heard by the crewmember.

(*c*) When radio signal is being received, and the crew commander or a crewmember keys and talks on the intercom, radio and intercom signals are heard. If the INT ACCENT switch on the AM-1780/VRC is set to ON, the radio signal is lower than the intercom signal. This feature enables the crew commander and crewmember signals to be heard over the radio signals.

(*d*) Each crewmember and the crew commander can talk on the intercom in any position of the control box MONITOR switch except position C. When a person is talking on intercom, no one except the crew commander can use the radios for transmission. Position C can be used by the crew commander to talk to a person using a telephone connected to the C-2296/VRC or AM-1780/VRC.

(*e*) All signals (radio and intercom) can be heard on ALL position of the MONITOR switch. Individual radios are heard and controlled (keyed for transmission) by individual MONITOR switch positions except INT ONLY.

(*f*) When the MONITOR switch is set to INT ONLY, the audio accessory switch will key the intercom circuit on RADIO position as well as INTERCOM position.

(*g*) The C-2296/VRC cannot communicate on the radio and intercom circuits until the SIG-EXT-OFF switch on the C-2297/VRC is set to EXT. Then the position of the C-2297/VRC MONITOR switch will determine what circuit the user of the C-2296/VRC can use.

(*h*) When a telephone is connected to the LINE terminals of the C-2296/VRC or the LINE terminals of the AM-1780/VRC, communication from the crewmembers can only be conducted on a push-to-talk basis while the MONITOR switch is set to ALL. That is, the crewmember must key the audio accessory to intercom to talk to the telephone user and release the switch to hear the reply. See (*d*) above.

(*i*) When the audio output of a radio is connected to the AUDIO INPUT terminals of the AM-1780/VRC, the received radio signal is available on ALL position of the MONITOR switch.

(*j*) When the loudspeaker of the RT-524 (*)/VRC will not be heard or used by crewmembers, set the SPKR switch to OFF.

(*k*) During initial radio contact, set the VOLUME control of each control box to midposition, then set the VOLUME control on each radio for comfortable listening level. Thus, subsequent adjustment of the signal level is controlled by the individual control box VOLUME control.

(*l*) For radio retransmission operation using the C-2299/VRC connected to the AM-1780/VRC, use the procedures in paragraph 3-21.

b. Operating AM-1780/VRC (fig. 3-5). Except for the MAIN PWR switch, the AM-1780/VRC switches are not changed after initial setting. The MAIN PWR switch is the master switch for turning on the radios and the radio-intercom system. This occurs when the link in the radio mount of "A" radio is set for this operation (fig. 2-11).

(1) Set INSTALLATION switch to OTHER. This position is always used except when two receiver-transmitters ("A" and "C" radios; fig. 2-31 and 2-35) are operating in transmission mode (para 3-21).

(2) When the C-2299/VRC is connected to the AM-1780/VRC, set the RETRANS switch of the C-2299/VRC to OFF. This switch is not changed until the receiver-transmitters are operating in retransmission mode (para 3-21).

(3) To select crewmembers allowed to operate the receiver-transmitters, set the RADIO TRANS switch as follows:

(*a*) CDR + CREW — if all crewmembers are allowed to operate the receiver-transmitters.

(*b*) CDR ONLY — if only the crew commander is allowed to operate the receiver-transmitters.

(*c*) LISTENING SILENCE — if no crewmember is allowed to operate the receiver-transmitters.

(4) Set the INT ACCENT (intercom accentuated) switch according to the following options:

(*a*) If it is desired that the loudness of the

radio signals should be less than the intercom signals, set the switch to ON.

(*b*) If it is desired that the intercom and radio signals are the same loudness, set the switch to OFF.

(5) Turn on the AM-1780/VRC and associated radios in the system as follows:

(*a*) Set the MAIN PWR switch to NORM. The "A" radio, in turn, must be turned on by setting its POWER switch to LOW or HIGH. This action now applies power to the radio and back to the AM-1780/VRC POWER CKT BKR, and also to the "B" radio or R-442(*)/VRC's in the system.

(*b*) Set the POWER CKT BKR switch to ON to apply power to the AM-1780/VRC and control boxes. The AM-1780/VRC POWER indicator should light.

(6) To turn on only the intercom function of the AM-1780/VRC and the control boxes, set the MAIN PWR switch to INT ONLY and the POWER CKT BKR switch to ON. The INSTALLATION switch must be left in OTHER position.

(7) To turn off the AM-1780/VRC and associated radios, set the MAIN PWR switch to OFF.

(8) To turn off only the AM-1780/VRC and associated control boxes, set the POWER CKT BKR switch to OFF.

c. Operating C-2297/VRC and C-2298/VRC. (fig. 3-7 and 3-8). The following operational procedures apply to each C-2298/VRC and C-2297/VRC. Review the radio and intercom functions explained in *a* above.

(1) To use the control boxes for radio and intercom operation, turn on the AM-1780/VRC and the radios (*b*(1) through (5) above). Tune the radios to the assigned operating frequencies (para 3-17, 3-18 and 3-19).

(2) To use the control boxes for intercom operation only (radios turned off), adjust the AM-1780/VRC as explained in *b*(6) above.

(3) To hear signals of all radios and the intercom, set the MONITOR switch to ALL.

(*a*) To transmit on "A" radio, set the audio accessory switch to RADIO and release the switch to hear the reply.

(*b*) To use the intercom, set the audio accessory switch to INTERCOM. Talk and hear the reply.

(*c*) To listen to all received signals (radio and intercom), set the audio accessory switch to OFF.

(4) To use "A" radio, set the MONITOR switch to A.

(*a*) To transmit on "A" radio, set the audio accessory switch to RADIO and release the switch to hear the reply.

(*b*) To use the intercom, set the audio accessory switch to INTERCOM. Talk and hear the reply.

(*c*) To listen to radio "A" signals and intercom, set the audio accessory switch to OFF.

(5) To use receiver "B" radio, set the MONITOR switch to B.

(*a*) To hear receiver "B" radio, set the audio accessory switch to OFF.

(*b*) To use the intercom, set the audio accessory switch to INTERCOM. Talk and hear the reply.

(*c*) To transmit to the distant radio station, tune the associated receiver-transmitter to the frequency of the R-442(*)/VRC. Leave the MONITOR switch in B position (it controls "A" radio transmission) and set the audio accessory switch to RADIO. Release the switch to hear the reply on the R-442(*)/VRC. If desired, reset the receiver-transmitter to its assigned frequency.

(*d*) To listen to receiver "B" radio and intercom signals, set the audio accessory switch to OFF.

(6) To use receiver "C" radio, set the MONITOR switch to C. Use the procedures in (5) above to use receiver "C" radio, except leave the MONITOR switch in ALL position while transmitting to the distant radio station.

(7) To use receiver-transmitter "C" radio, set the MONITOR switch to C.

(*a*) To transmit on "C" radio, set the audio accessory to RADIO and release the switch to hear the reply.

(*b*) To use the intercom, set the MONITOR switch to INT ONLY.

(8) To use only the intercom, set the MONITOR switch to INT ONLY. Set the audio accessory to INTERCOM. Talk and hear the reply.

(9) To communicate with a user of a telephone connected to the AM-1780/VRC or C-2296/VRC, set the MONITOR switch to ALL. When the telephone is connected to the C-2296/VRC, the C-2297/VRC SIG-EXT-OFF switch must be set to EXT. The C-2298/VRC of the crew commander can set the MONITOR switch to C for this function. To talk to the telephone user, set the audio accessory switch to INTERCOM and talk; release the switch to hear the reply.

CAUTION

If any other crewmember is keyed on intercom, the reply cannot be heard.

d. Operating C-2296/VRC (fig. 3-6). An external call light is provided on the box in which the C-2296/VRC is mounted on the outside of the vehicle for the purpose of attracting the attention of personnel outside the vehicle.

(1) Use the following procedures to attract the attention of C-2297/VRC and C-2296/VRC users:

(*a*) To attract the attention of the C-2296/VRC user, operate the C-2297/VRC SIG-EXT-OFF switch a number of times. The external call light at the C-2296/VRC should light each time the switch is operated.

(*b*) To attract the attention of the C-2297/VRC user, operate the push-to-talk switch on the H-207/VRC. The C-2297/VRC indicator light should light.

(2) To establish communication between C-2297/VRC and C-2296/VRC users, proceed as follows:

(*a*) Set C-2297/VRC SIG-EXT-OFF switch to EXT and the MONITOR switch to INT ONLY. C-2297 indicator remains lighted.

(*b*) Set the audio accessory switch to INT ONLY and talk to the C-2296/VRC user.

(*c*) Under the conditions in (*a*) and (*b*) above, other crewmembers can talk on the intercom with the C-2296/VRC user.

(*d*) At the C-2296/VRC, press the H-207/VRC push-to-talk switch and talk on the intercom to crewmembers.

(3) To talk on and listen to radios in vehicle, request the user of the C-2297/VRC to set the MONITOR switch to the position that controls the desired radio (A, B, or C). To transmit on the radio, operate and hold the RAD-INT sw. to RAD (spring-loaded) while operating the H-207/VRC push-to-talk switch, then release the push-to-talk switch to hear the radio reply.

(4) When intercom or radio operation from the C-2296/VRC is no longer required, set the C-2297/VRC SIG-EXT-OFF switch to OFF. The C-2297/VRC indicator lamp goes out indicating the C-2296/VRC is disconnected.

3-21. Retransmission Operation for Radio Sets AN/VRC-49 and AN/VRC-45

Radio retransmission is an arrangement of two radios connected together to provide automatic retransmission of signals between two radios that are too far apart to communicate directly with each other.

a. General.

(1) Radio Sets AN/VRC-49 and AN/VRC-45 are radio configurations provided with retransmission control C-2299/VRC used for radio retransmission (fig. 2-23, 2-27, 2-31, and 2-35).

(2) Either receiver-transmitter of the AN/VRC-12 series radios can be connected for retransmission with other radios. Refer to paragraph 6-7 for information on the procedures.

b. Frequency Selection for Retransmission. To identify the radios involved in the retransmission operation, the retransmission site radios are identified as retransmission radios No. 2 and 3, and the distant radios as terminal radios No. 1 and 4. Radios No. 1 and 2 operate on one frequency; radios No. 3 and 4 on another frequency.

(1) Frequencies selected for the receiver-transmitters at the retransmission site must be such that the transmitting power of one will not interfere with the signals being received on the frequency of the other receiver-transmitter.

(2) The frequencies selected will be at least 10 MHz apart.

(3) Use the retransmission interference charts (fig. FO-1) and the information given in paragraph 2-2*b*(4) to select noninterfering frequencies for the retransmission site radios.

c. Connections.

(1) Figures 2-23 and 2-27 show the cabling used when the C-2299/VRC is connected directly to the receiver-transmitters.

(2) Figures 2-31 and 2-35 show the cabling used when the C-2299/VRC is connected to the AM-1780/VRC for operation with receiver-transmitters used with the radio-intercom system.

(3) Refer to paragraph 3-15 for information covering the use of audio accessories connected to the C-2299/VRC or the control boxes of the radio-intercom system.

d. Retransmission Operation. After the retransmission site radios are set up for retransmission, communication proceeds automatically on push-to-talk basis between the terminal radios.

(1) Set the C-2299/VRC RETRANS switch to OFF.

(*a*) When audio accessories are connected to C-2299/VRC (*c*(1) above), set C-2299/

VRC RAD TRANS switch to position 1 to communicate through receiver-transmitter connected to J701 and to position 2 to communicate through the other receiver-transmitter.

(*b*) When the C-2299/VRC is connected to the radio-intercom system (*c*(2) above), the audio accessories connected to the control boxes must be used for radio communication. Set the MONITOR switch to A to communicate through "A" radio with terminal radio No. 1, and to position C to communicate through "C" radio with terminal radio No. 4.

(2) Turn on and tune each receiver-transmitter to assigned frequency (para 3-17*b* and *c*). Establish a satisfactory squelch mode operation with each terminal radio before proceeding to use the radios for retransmission.

(3) Notify each terminal radio to communicate directly with each other; then set the C-2299/VRC RETRANS switch to ON. When the C-2299/VRC is used in the radio-intercom system, also set the AM-1780/VRC INSTALLATION switch to RETRANS.

(*a*) Communication between the terminal radios progresses automatically. While communication is in progress, the CALL indicator of the receiving radio lights and the blower motor of the other radio should be heard operating.

(*b*) When the audio accessory is connected to the C-2299/VRC, the retransmission can be monitored by setting to position 1 while the retransmission is progress from terminal radio No. 1 to terminal radio No. 4; and to position 2 when retransmission is in progress in the opposite direction.

(*c*) When the C-2299/VRC is in the radio-intercom system, monitor the retransmission using the ALL position of the control box MONITOR switches.

(*d*) The setting of the VOLUME control of the receiver-transmitters has no effect on the signal between the retransmission site radios.

(*e*) While the C-2299/VRC RETRANS switch is set to RETRANS and the AM-1780/VRC INSTALLATION switch is set to RETRANS, the retransmission site radios cannot be keyed for transmission.

(4) When retransmission is completed or to establish contact with the terminal radios, set the C-2299/VRC RETRANS switch to OFF. In the radio-intercom system, also set the AM-1780/VRC INSTALLATION switch to OTHER.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-22. Recognition of Jamming; Antijamming

a. Recognition and Identification of Jamming. Under real or simulated tactical conditions, it is possible to be jammed by the enemy. Jamming is easily done by transmitting a strong signal on the same frequency, making it difficult or impossible to hear the desired signal. Unusual noises or strong interference heard on the receiver may be eneny jamming, signals from a friendly station, noise from a local source, or a defective receiver. To determine whether the interference is originating in the receiver, disconnect the antenna and short the center conductor of the ANT receptacle to the chassis. If the interference continues, the receiver is defective.

b. Antijamming. When it is first noticed that a channel is being jammed, notify your immediate superior officer and continue to operate the equipment. To provide maximum intelligibility of jamming signals follow the operational procedure below.

(1) The effects of enemy jamming may be reduced by locating the vehicle so that nearby obstructions act as a screen in the direction of probable sites of enemy jamming transmitters. This screen action may also reduce the transmitted signal strength toward the enemy, thereby making it more difficult for the enemy to intercept signals. If possible, try several different locations within the prescribed area and stay at one where jamming is minimum.

(2) Vary the VOLUME control. The level of the desired signal may be raised enough to be distinguished from the jamming signal.

(3) If the distant transmitter is operating on low power and the operating frequency is being jammed, request the distant transmitter to turn the POWER switch to HIGH. The additional power output may override the received jamming signal and thus permit the signal to be heard.

(4) If the above procedures do not provide sufficient signal separation for operation, change to the alternate frequency, with permission from radio net control station.

3-23. Operation at Low Temperatures and in Desert and Dusty Areas

a. Operation at Low Temperatures.

(1) Keep the front panel controls free of ice

so that the control shafts can be turned. The RT-246(*)/VRC may become damaged if the MC and KC controls are not free to turn when a pushbutton is depressed.

(2) Keep the antenna free of ice. Communication will be impared if ice is allowed to collect on the antenna.

(3) On receiver-transmitters, keep the blower air intake and exhaust ports free of ice.

(4) Interconnecting cables and cords lose some of their flexibility at low temperatures. Be careful not to strain them.

(5) If possible, keep the radios and radio-intercom equipment turned on when it is not being used for communication.

(6) Turn on and allow the equipment to warm up before changing the MC and KC con trols or using the RT-246(*)/VRC pushbuttons.

(7) Before turning on the radio in extreme cold temperatures, turn on the vehicle or shelter heater to warm up the radio.

b. Operation in Desert and Dusty Climates. When operated in desert and dusty climates, large amounts of sand and dust may collect on the equipment. Keep the equipment as clean as possible. Keep the blower air intake and exhaust ports of the receiver-transmitters free of sand and dust.

3-24. Operation Under Emergency Conditions

a. Radio System.

(1) When a R-442(*)/VRC fails to function, the receiver-transmitter may be tuned to the R-442(*)/VRC operating frequency. When the radio is the RT-246(*)/VRC, the R-442(*)/VRC frequency may be set up on one of the pushbuttons.

(2) When the whip antenna of the receiver-transmitter is broken, damaged or lost and a R-442(*)/VRC is in the vehicle, the R-442(*)/VRC antenna can be disconnected from the R-442(*)/VRC and connnected to the receiver-transmitter. This may reduce communication range.

(3) Similarily, when the R-442(*)/VRC whip antenna is broken, dmaged or lost, the receiver-transmitter whip antenna can be connected to the R-442(*)/VRC. Before doing so, however, the matching unit networks must be positioned properly for the operating frequency of the R-442(*)/VRC as follows:

(*a*) When the AT-912/VRC is used, this is done by tuning the receiver-transmitter to the R-442(*)/VRC frequency while the CX-4722/VRC is still connected to the matching unit and the receiver-transmitter.

(*b*) When the AS-1729/VRC is used, this can be done after the antenna connection is made to the R-442(*)/VRC by manually setting the MX-6707/VRC band control (fig. 2-1) to the position that includes the R-442(*)/VRC operating frequency.

b. Radio-Intercom System.

(1) When the radio cannot be controlled either for transmission or reception, from audio accessories connected to the control boxes, connect the audio accessory directly to the radio (fig. 3-16).

(2) In some combat vehicles, the audio accessory of the crew commander is connected to a pair of audio receptacles located in the cupola. From these receptacles, an extension cable is connected between the cupola receptacles and the commander's C-2298/VRC. If communication cannot be satisfactorily made from the cupola receptacles, disconnect the extension cable connections from the crew commander's C-2298/VRC and connect the audio accessory to the C-2298/VRC.

(3) When communication cannot be conducted from the C-2296/VRC or from field wires connected between a field telephone and the LINE binding posts of the C-2296/VRC, connect the wires to the LINE binding posts of the AM-1780/VRC.

(4) Similarily, the intercom circuits of the radio-intercom systems of different vehicles can be interconnected by installing field wire between the LINE binding posts of the AM-1780/VRC in each vehicle.

CHAPTER 4

OPERATOR MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE

4-1. Scope of Operator Maintenance

a. The following duties normally are performed by the operator and user of the AN/VRC-12 series radios and associated receiver-intercom system.

(1) Preventive maintenance (para 4-2; tables 4-1 and 4-2).

(2) Troubleshooting (para 4-4 through 4-6).

(3) Cleaning equipment (para 4-3).

4-2. Preventive Maintenance, General

To insure that the radio sets and the radio-intercom system used with the radio sets are always ready for operation, they must be inspected periodically and systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed in tables 4-1 and 4-2. Defects discovered during the inspection will be noted for future correction to be made as soon as the inspection is completed. Stop operation immediately if a deficiency is noted during operation which could damage the equipment. Record all deficiencies together with the corrective action taken; use DA Form 2404 (TM 38-750).

Table 4-1. Operator Preventive Maintenance Checks and Services—Daily Schedule

Item No.	Item to be inspected	Procedure	Reference
		Notes 1. Select those items applicable to the equipment provided in the installation. 2. If the equipment is not used daily, the applicable performance requirements shall be performed at least once a week.	
1	RECEIVER-TRANSMITTER.	Check to see that:	
1*a*	ANTENNA	*a.* Safety wire is installed between bottom of antenna element and MX-6707/VRC.	*a.* Fig. 2-2.
1*b*		*b.* Antenna tie-down assembly is either stowed or holding the antenna down properly.	*b.* Fig. 1-11.
1*c*		*c.* Antenna tip cap is in place on the top antenna section.	
1*d*		*d.* Antenna sections are not split or shattered.	
1*e*		*e.* When RC-292 is used, perform required operator maintenance.	*e.* TM 11-5820-348-12.
2	R-442(*)/VRC ANTENNA.	Check to see that:	
2*a*		*a.* Antenna tip cap is in place on the top antenna section.	
2*b*		*b.* If antenna is tied down, it is done at such an angle that the tip will not injure personnel.	*b.* Para 2-7*c*.
3	AUDIO ACCESSORIES.	Check to see that:	Fig. 3-11 through 3-14.
3*a*		*a.* Cable insulation is not damaged.	
3*b*		*b.* Moisture barrier is in place in the microphone and the earphone, if applicable.	
3*c*		*c.* Microphone boom assembly functions to hold microphone in desired position in front of the user's mouth.	

Item No.	Item to be inspected	Procedure	Reference
3*d*		*d.* Both earphones have required accessories.	
3*e*		*e.* When not in use, the audio accessories are stowed so that they will not be damaged by equipment and personnel.	
3*f*		*f.* If used, the loudspeaker is securely installed in its position in the vehicle.	
3*g*		*g.* O-rings in cable connectors are in place and are not loose fig 2–19).	
4	RECEIVER-TRANSMITTER.	Turn on, and tune to assigned frequency.	Para 3–17.
		Connect audio accessories to front panel receptacles. Key and talk to distant radio station.	
4*a*		*a.* During transmission sidetone should be heard; the blower motor should be heard running.	
4*b*		*b.* During reception, signals from the other radio station should be heard.	
4*c*		*c.* The CALL lamp should light during squelch operation.	
5	RECEIVER-TRANSMITTER WITH C–2299/VRC.	Check radio operation with audio accessory connected to C–2299/VRC.	Para 3–21.
5*a*		*a.* During transmission, receiver-transmitter blower is heard operating; sidetone is heard. Received signal can be heard clearly.	
5*b*		*b.* In retransmission configurations, (AN/VRC–49 and AN/VRC–45), request two distant radio terminals to communicate with each other through the retransmission site. Retransmission operation should function satisfactorily in both directions.	
6	RT–246(*)/VRC without C–2742/VRC.	Check operations of the automatic pushbuttons that have been set up on assigned operating frequencies, if the RT–246(*)/VRC is to be used under this condition.	Para 3–17*d*.
7	RT–246(*)/VRC with C–2742/VRC.	Check operation of the C–2742/VRC (or two C–2742/VRCs if provided) for:	Para 3–18.
7*a*		*a.* Remote power control of the RT–246(*)/VRC.	
7*b*		*b.* Remote control of the frequencies set up on the RT–246(*)/VRC.	
8	R–442(*)/VRC	Turn on and tune to assigned frequency. Use associated receiver-transmitter and tune it to R–442(*)/VRC frequency. Establish contact with radio with which R–442(*)/VRC is in contact and check reception of R–442(*)/VRC as follows:	Para 3–19.
8*a*		*a.* During reception, signals from the distant radio terminal should be heard.	
8*b*		*b.* The CALL lamp should light during squelch operation.	
9*a*	Radio operation of radio-intercom system.	*a.* Radio communication from receiver-transmitters and R–442(*)/VRCs using performance procedures in item numbers 4 through 8 above should be satisfactory before proceeding.	
9*b*		*b.* From *each* audio accessory, *at each control box,* check for satisfactory radio transmission and reception of each radio in the radio system:	*b.* Para 3–20.
9*b*(1)		(1) From ALL, A, and B position of control box MONITOR switch.	
9*b*(2)		(2) From B and C positions for R–442(*)/VRC reception.	
9*b*(3)		(3) From A and C for two receiver-transmitters.	
9*b*(4)		(4) From C–2299/VRC for retransmission function.	
10*a*	Intercom function of radio-intercom system.	*a.* From each audio accessory at each control box, check for satisfactory intercom communication with crewmembers position.	*a.* Para 3–20.

Item No.	Item to be inspected	Procedure	Reference
10*b*		*b.* When it is known or anticipated that a telephone will be connected to the intercom system at the C–2296/VRC or AM–1780/VRC, perform a check of the intercom circuit from a test telephone connected to the AM–1780/VRC or C–2296/VRC. Communication should be established satisfactorily.	*b.* Para 3–20.

Table 4–2. Operator Preventive Maintenance Checks and Services—Weekly Schedule

Item No.	Item to be inspected	Procedure	Reference
		Notes *1.* Perform the following operations on those items that are applicable to the installation. *2.* Refer to paragraph 4–3 for cleaning information.	
1	ANTENNAS	Perform the following operations on each antenna:	
1*a*		*a.* Clean the antenna sections and the matching unit.	
1*b*		*b.* Check to see that the antenna cable and control cable CX–4722/VRC are locked on the antenna receptacles.	
1*c*		*c.* When receiver-transmitter whip antenna sections are not installed on the matching unit, protect the contact on the top of the matching unit spring with sturdy masking tape.	*c.* Fig. 2–1.
1*d*		*d.* When the R–442(*)/VRC whip antenna sections are not installed, remove dirt and water from the antenna mast section receptacle and cover the receptacle with the rubber cap or use masking tape to keep out dirt and water.	*d.* Fig. 2–5 or 2–6.
2	RECEIVER-TRANSMITTER.	Perform the following:	
2*a*		*a.* Clean the top and sides of the case.	
2*b*		*b.* Remove all articles from the back and sides of the radio to allow free passage of air into the blower motor in the rear and from the sides of the heat exchanger.	
2*c*		*c.* Check to see that the heat exchanger covers are not removed.	*c.* Fig. 5–1.
2*d*		*d.* In dusty areas, remove the back and side plates from the heat exchanger and clean the area. Replace the plates.	*d.* Fig. 5–1.
2*e*		*e.* Tighten the covers of the front panel receptacles.	*e.* Fig. 5–3.
2*f*		*f.* Check to see that the tie cords and chain are attached to the receptacle covers and the front panel.	*f.* Fig. 3–3.
3	R–442(*)/VRC	Clean the top and sides.	
4	MT–1029/VRC and	Perform the following on each unit:	
4*a*	MT–1898/VRC (fig. 2–7 and 2–8).	*a.* If radio is not installed on the mount, clean the top tray of the unit, and put the rubber receptacle cover on the radio receptacle.	
4*b*		*b.* Check to see that the receptacle cover chain is attached to the side of the mount.	
4*c*		*c.* Check to see that the grounding strap(s) are attached between the top tray and bottom base assembly.	
4*d*		*d.* On MT–1029/VRCs that have a hole instead of a louvered opening for the receiver-transmitter blower motor, check to see that the clip-on cover is in place on MT–1029/VRCs that are installed in open vehicles (such as Jeeps). However, the cover is not required on MT–1029/VRCs in inclosed vehicles (such as tanks).	*d.* Para 2–10*a*(7).
4*e*		*e.* Dust cover(s) are on unused cable receptacles J22 or J23 of the junction box (fig 2–9 and 2–10).	

Item No.	Item to be inspected	Procedure	Reference
		NOTE Typical dust covers are shown in figure 2-16 and are also used on cable receptacles of radio mounts, AM-1780/VRC, and control boxes.	
5	WARNING DECALS	Check to see that warning decals, DA Label 132, are intact and situated in appropriate places near the driver and the radio. Coat label with clear lacquer or varnish.	SB 11-624.
6	AUDIO ACCESSORIES.	Clean all parts of the audio accessories. Clean the CVC helmet, inside and outside.	
7	BATTERY COMPARTMENT OF VEHICLE.	On vehicles in which the radio power cable CX-4720/VRC is connected to the vehicle battery (or other power source), check the following:	Fig. 2-15.
7*a*		*a.* The battery terminals are free of corrosion.	
7*b*		*b.* The cable lugs are tightened securely by the battery clamp bolts.	
7*c*		*c.* The proper colored cable wires are connected to the positive and negative terminals of the power source.	
		d. The power cable leads are labeled.	*d.* Para 2-11*a*(1).
8	MX-7778/VRC	Perform the following:	TM 11-5915-223-12., or TM 11-5915-224-14.
8*a*		*a.* Clean the case.	
8*b*		*b.* Check to see that the boot covering the ON-OFF switch is intact.	
8*c*		*c.* Check to see that the ground strap is connected between the top and bottom of one of the mounting bolts.	
8*d*		*d.* Put the receptacle cover on the unused receptacle.	
9	C-2299/VRC	Perform the following:	Fig. 3-9.
9*a*		*a.* Clean the unit.	
9*b*		*b.* Check to see that the dust cover is installed on unused receptacle.	
10	C-2742/VRC	Perform the following:	Fig. 3-10.
10*a*		*a.* Clean the unit.	
10*b*		*b.* Check to see that the latch confines the rotation of the CHAN SEL switch to desired positions.	
10*c*		*c.* Check to see that the dust cover is installed on unused receptacle.	
11	AM-1780/VRC	Perform the following:	Fig. 3-5.
11*a*		*a.* Clean the front panel.	
11*b*		*b.* Check to see that dust covers are installed on unused receptacles.	
12	C-2298/VRC	Perform the following:	Fig. 3-8.
12*a*		*a.* Clean the front panel.	
12*b*		*b.* Check to see that the locknuts for the audio accessory receptacles are tight.	
13	C-2297/VRC	Perform the following:	Fig. 3-7.
13*a*		*a.* Clean the front panel.	
13*b*		*b.* Check to see that the locknuts for the audio accessory receptacles are tight.	
13*c*		*c.* Check to see that the connectors of the cables to the vehicle outlets are tight.	
14	C-2296/VRC	Perform the following:	Fig. 3-6.
14*a*		*a.* Clean the box in which the C-2296/VRC is installed. Clean the H-207/VRC and its retractile cable.	
14*b*		*b.* Check to see that the indicator lamp socket is secured to the box in which the C-2296/VRC is installed.	
14*c*		*c.* Check to see that the H-207/VRC is secured to the clips that hold it to the cover of the box.	

4-3. Cleaning Equipment

The exterior surfaces of the equipment should be clean; that is there should be no dust, dirt, grease, oil, or fungus on the surfaces.

a. Remove dust and loose dirt with a clean cloth.

WARNING

The fumes of Cleaning Compound, Trichloroethane (Federal stock No. 6810-292-9625; 1 qt) are toxic. Provide enough ventilation whenever required. Do not use near an open flame. Trichloroethane is not flammable, but exposure to the open flame converts the fumes to a highly toxic, and dangerous gas.

b. Remove grease, oil, fungus and ground-in dirt from the equipment with a cloth dampened (not wet) with cleaning compound.

c. If the equipment is washed using a water hose, do not direct the water directly at the front panels and cable connectors. Wipe the equipment after using the water hose.

CAUTION

Use only clear water to clean the plastic body of the MX-6707/VRC (B, fig. 2-1). Trichloroethane and other cleaning solvents attack the plastic causing it to be porous.

Section II. OPERATOR TROUBLESHOOTING PROCEDURES

4-4. Troubleshooting by Visual Inspection

If following checks do not clear trouble, notify organizational maintenance.

a. Power Failure. If, during operation of the radio or radio-intercom equipment, the equipment appears to lose power, make the following checks:

(1) If the vehicle has a master switch, check to see that it is turned on.

(2) Check to see that the radio is pushed back fully on its mount and that the mounting clamps are tightened fully (fig. 1-14, 1-15, or 1-16).

(3) When the CX-4720/VRC power cable is connected directly to the vehicle battery, check to see that the battery bolts are tightened on the battery terminals (fig. 2-15).

(4) When the CX-4720/VRC is connected to the MX-7778/GRC, check to see that the MX-7778/GRC ON-OFF switch is set to ON, and that the cables connected to the MX-7778/GRC and the radio mount are fully tightened to their receptacles.

(5) If the C-2742/VRC is being used with the RT-246(*)/VRC, check to see if the C-2742/VRC PWR switch is set to LO or HI.

(6) Check to see that the POWER switch on the radio is turned on. When the AM-1780/VRC with the radio-intercom system is used, check to see that its MAIN PWR switch is set to NORM. Also check to see that the AM-1780/VRC INSTALLATION switch is set to OTHER.

b. Radio Communication Failures. If, during radio operation, communication cannot be reestablished while audio accessories are connected to the radios, make the following checks:

(1) Check to see if the assigned frequency is set up on the radio.

(2) Check the following whip antenna features:

(*a*) Is the whip antenna intact?

(*b*) Is the antenna touching a metal structure such as a bridge? Or is the vehicle under a bridge?

(*c*) Check the tightness of the whip antenna sections.

(*d*) Check to see that the antenna cable is connected between the radio and the antenna; and that the cable connections are tight.

(3) If squelch operation is being used, set the SQUELCH switch to OFF.

(4) If the C-2742/VRC is being used with the RT-246(*)/VRC, check to see whether the assigned frequency is displayed in the RT-246 (*)/VRC dial window.

c. Failures While Using Radio-Intercom System. When radio or intercom communication failures occur while using audio accessories connected to the control boxes of the radio-intercom system, make the following checks:

(1) Check to see that the audio accessory cable connectors are locked on the control box receptacles.

(2) Note that radio communication from all control boxes will be broken if another crewmember keys on the intercom circuit. However, radio communication from the crew commander's control box (always connected to J504 of AM-1780/VRC (fig. 2-28)) is not interrupted when another crewmember keys on intercom.

(3) Check to see that the POWER indicator on the AM-1780/VRC is lighted. If not, set the POWER CKT BKR switch to ON.

(4) If the C-2297/VRC fails while the turret is being turned, the turret slip rings may be at fault.

(5) If C-2296/VRC is inoperative, check the cabling between the C-2296/VRC and the C-2297/VRC for damage.

(6) For radio failures, use the suggestions given in *b* above.

4-5. Procedures for Operator to Troubleshoot Radio System Equipment

a. General. No tools or test equipment are required for the operator to troubleshoot radio system failures.

(1) When the corrective measures given in the following charts do not clear the trouble, refer the trouble to higher maintenance facilities for correction.

(2) The procedures for locating a defective component in the radio system apply whether the radio system is used with the radio-intercom equipment or is used without it. When radio communication failures occur while operating the radios from the control boxes, refer to paragraph 4-6.

b. Troubleshooting RT-524(*)/VRC

Item No.	Symptom	Probable causes	Corrective measures
1	No sound is heard, motor will not run when radio is keyed; dial lamp does not light. Light switch is set to ON.	*a.* Circuit breaker of radio is tripped.	*a.* Set POWER switch to OFF BREAKER-RESET position, then back to LOW or HIGH. Dial lamp should light when power is available at the radio.
		b. Power cable CX-4720/VRC is defective; or vehicle battery is defective.	*b.* Make the following checks, in turn: (1) Check to see that power cable is connected to MT-1029/VRC receptacle. (2) Push radio back fully onto MT-1029/VRC; tighten MT-1029/VRC mounting clamps. (3) Check power cable connections at vehicle battery: check for tight connection and see that cable wires are connected to proper battery terminals (red-white to positive; blue-green to negative) (fig. 2-15). (4) If the power cable is connected to "Bendix" connector, tighten the connector on the vehicle power receptacle or the MX-7778/VRC. (5) Set MX-7778/VRC ON-OFF switch to ON. (6) Turn vehicle master switch to ON, if this switch controls power to the radio system. (7) Start vehicle engine and let run at idle. If vehicle battery is weak, this action should recharge the battery.
		c. Defective receiver-transmitter.	*c.* Refer unit to repair facility.
2	Radio blower motor does not run when audio accessory is keyed; rushing noise can be heard and stops when the radio is keyed.	*a.* Defective audio accessory keying circuit.	*a.* Make the following checks: (1) Use another audio accessory. (2) Change the audio accessory to the other audio accessory receptacle (SPKR or RETRANS R/W).
		b. Defective receiver-transmitter.	*b.* Refer unit to repair facility.
3	Blower motor runs when audio accessory is keyed, but sidetone of the transmission is not heard. In RT-524(*)/VRC, sidetone is heard on loudspeaker when SPKR switch is set to ON.	*a.* Defective audio accessory earphone circuit.	*a.* Perform the same operations given in item 2 above.
		b. Defective receiver-transmitter.	*b.* Refer unit to repair facility.

Item No.	Symptom	Probable causes	Corrective measures
4	When radio is keyed, sidetone is heard. Reply of distant radio is not heard.	*a.* Tuning controls not set to assigned frequency.	*a.* Make the following checks: (1) Attempt a communication check with a nearby radio. (2) Change the tuning controls to another frequency, then back to the assigned frequency. (3) Attempt to establish communication on an alternate frequency.
		b. Defective whip antenna system.	*b.* Make the following checks: (1) When changing frequencies, listen for the sound of the relays operating in the matching unit of the whip antenna. (2) Check the tightness of the antenna cables CG–1773/U and CX–4722/VRC at the radio and the whip antenna matching unit. (3) When the MX–6707/VRC matching unit of the AS–1729/VRC is used, check to see that the control switch on the MX–6707/VRC is positioned (automatically) to include the frequency set up on the radio. If not, set the control manually, and attempt to communicate with the distant radio. (4) Check to see that both whip antenna sections are fully screwed to each other and to the top of the matching unit. (5) If the whip antenna is tied down, untie it. (6) Occasionally, locating the vehicle at another site not far from the present position helps to establish communication.
		c. Defective receiver-transmitter.	*c.* Refer unit to repair facility.
5	When SQUELCH switch is set to NEW ON, calls from distant radio are not received. (CALL lamp should light, after which the received signal should be heard.)	*a.* Distant radio's squelch control is not set to position that would send required squelch tone (para 3–16*a*(1)).	*a.* Set SQUELCH switch to OFF; contact distant radio and ask him to set squelch control to proper position.
		b. Distant radio is too far away for the squelch tone to activate this radio, or squelch circuit is defective.	*b.* Communicate with distant radio without squelch mode operation (by setting the SQUELCH switch to NEW OFF).
		c. Receiver-transmitter or whip antenna system defective.	*c.* Perform the troubleshooting operations given in item 4 above.

c. Troubleshooting RT–246(*)/VRC and C–2742/VRC. For communication failures of the RT–246(*)/VRC, use the procedures given in *b* above for the RT–524(*)/VRC. For pushbutton tuning troubles and for troubles when the C–2742/VRC is being used to control the RT–246 (*)/VRC, use the troubleshooting procedures given below. The procedures concerning the C–2742/VRC apply whether there are two or one C–2742/VRC in the system.

Item No.	Symptom	Probable causes	Corrective measures
1	After operation of a pushbutton, the automatic tuning mechanism does operate to tune the RT–246(*)/VRC to a particular frequency.	*a.* The BAND switch is set to wrong position.	*a.* Set the BAND switch to the AUTO position.
		b. The particular pushbutton circuit is defective.	*b.* Select another pushbutton and set up the desired frequency on it (para 3–17*d*).
		c. The pushbutton circuits are defective.	*c.* Tune the RT–246(*)/VRC manually with the MC and KC controls. Refer the receiver-transmitter to repair facility if pushbutton tuning must be available.

Item No.	Symptom	Probable causes	Corrective measures
2	Communication cannot be established with distant radio while C-2742/VRC is controlling RT-246(*)/VRC.	*a.* The RT-246(*)/VRC has been turned off.	*a.* Set the PWR switch of the C-2742/VRC to LO position. The CONTROL indicator lamp should light. Rotate the lens cap to the right to permit the lighted lamp to be seen. If communication cannot be established with the PWR switch in LO position, set the switch to HI position.
		b. Cable connections are loose.	*b.* Tighten cable connections between the RT-246(*)/VRC and the C-2742/VRC and between two C-2742/VRCs.
		c. C-2742/VRC is defective.	*c.* Return control to the RT-246(*)/VRC by setting the RT-246(*)/VRC POWER switch to LOW or HIGH as required.
		d. Receiver-transmitter is defective.	*d.* If communication cannot now be established from the receiver-transmitter, refer unit to repair facility.
3	When C-2742/VRC CHAN SEL switch is positioned to desired frequency position, the automatic tuning mechanism in the RT-246(*)/VRC does not operate to tune the radio to the desired frequency.	*a.* The RT-246(*)/VRC switches are not set to the proper position.	*a.* On the RT-246(*)/VRC, set the BAND switch to AUTO, and the POWER switch to REMOTE.
		b. The control switch (SW) on the C-2742/VRC was not operated before the CHAN SEL switch position was changed to the desired frequency setting.	*b.* Perform the following: (1) Operate the control switch (SW) momentarily. The CONTROL indicator lamp should light indicating that the C-2742/VRC has control of the RT-246(*)/VRC. (2) Change the CHAN SEL switch to another position. At this operation, the RT-246(*)/VRC tuning mechanism should be heard operating. Reset the CHAN SEL switch to the original position. The desired frequency should be displayed in the RT-246(*)/VRC dial window.
		c. Automatic tuning circuits of RT-246(*)/VRC are defective.	*c.* Perform the following: (1) Use pushbutton tuning to select the desired operating frequency. (2) Tune the RT-246(*)/VRC manually with the MC and KC controls. (3) Refer the RT-246(*)/VRC to repair facility.
		d. Defective C-2742/VRC.	*d.* Refer the C-2742/VRC to repair facility if automatic tuning can be accomplished at the RT-246(*)/VRC.

d. Troubleshooting C-2299/VRC Connected to Receiver-Transmitters. The following troubleshooting operations apply to a C-2299/VRC that is connected to a receiver-transmitter, either as a convenient point for the audio accessory, or as part of the retransmission configuration (AN/VRC-49, AN/VRC-45, AN/VRC-54, or AN/VRC 55). Refer to paragraph 4-6*b* for troubles with radio retransmission and C-2299/VRC when it is connected to the AM-1780/VRC in radio-intercom system.

Item No.	Symptom	Probable causes	Corrective measures
1	When C-2299/VRC RETRANS switch is set to OFF and RAD TRANS switch is set to 1 or 2 position, the receiver-transmitter does not respond to control from the audio accessory connected to C-2299/VRC.	*a.* Cable connectors loose.	*a.* Check tightness of cable connectors at C-2299/VRC and MT-1029/VRC receptacles.
		b. Defective audio accessory or receiver-transmitter.	*b.* Make the following checks: (1) Connect the audio accessory to the receiver-transmitter and make a communication check with the distant radio terminal. (2) If unsuccessful, use another audio accessory known to be good. Failure to establish communication indicates that receiver-transmitter may be defective. Refer to *b* above for troubleshooting receiver-transmitter.
		c. Defective C-2299/VRC.	*c.* If communication can be established using audio accessory connected to receiver-transmitter, refer C-2299/VRC to repair facility.

Item No.	Symptom	Probable causes	Corrective measures
2	When C-2299/VRC RETRANS switch is set to ON, automatic retransmission of signals is not processed from one receiver-transmitter to the other. (Radios must be set up for squelch mode operation.)	*a.* One or the other receiver-transmitter is defective.	*a.* Connect the audio accessory to each receiver-transmitter, in turn, and attempt to establish radio contact with the distant radio terminals using squelch mode operation (para 3-16*c*). If radio operation is unsatisfactory, refer to *b* above for receiver-transmitter troubleshooting procedures.
		b. Cable connectors loose	*b.* Tighten cable connections at C-2299/VRC and at MT-1029/VRC of each receiver-transmitter.
		c. Defective C-2299/VRC.	*c.* Refer unit to repair facility.

e. Troubleshooting R-442(*)/VRC

Item No.	Symptom	Probable causes	Corrective measures
1	No sound is heard; dial lamp does not light. Associated receiver-transmitter has operating power.	*a.* Circuit breaker of radio is tripped.	*a.* Set POWER switch to ON RESET position. Dial lamp should light indicating power is available at the R-442(*)/VRC.
		b. Power cable CX-4721/VRC, between R-442(*)/VRC and receiver-transmitter mount is loose.	*b.* Check tightness of CX-4721/VRC connectors.
		c. R-442(*)/VRC is not properly seated on MT-1898/VRC.	*c.* Push R-442(*)/VRC back fully onto the MT-1898/VRC and tighten the mounting clamps.
		d. Defective R-442(*)/VRC.	*d.* Refer unit to repair facility.
2	No sound is heard, dial lamp is lighted.	*a.* Defective audio accessory.	*a.* Use another audio accessory. Connect the audio accessory to the other AUDIO receptacle.
		b. Defective R-442(*)/VRC.	*b.* Refer unit to repair facility.
3	Rushing noise is heard, but signal of distant radio is not heard.	*a.* Tuning controls not set to assigned frequency.	*a.* Make the following checks: (1) Attempt a communication check with the associated receiver-transmitter by tuning to the receiver-transmitter frequency, and then tuning the receiver-transmitter to the original R-442(*)/VRC frequency. (2) Attempt to establish communication with a nearby transmitter.
		b. Defective whip antenna system.	*b.* Make the following checks: (1) Check the tightness of the antenna cable at the R-442(*)/VRC and at the whip antenna mast base. (2) Check to see that all antenna mast sections are fully screwed to each other and to the top of the mast base. (3) If the whip antenna is tied down, untie it. (4) Occasionally, locating the vehicle at another site not far from the present position helps to establish communication.
		c. Defective R-442(*)/VRC.	*c.* Refer unit to repair facility.

4-6. Procedures for Operator to Troubleshoot Radio-Intercom System

a. General. The troubleshooting procedures in *b* below cover the AM-1780/VRC, the control boxes connected to it, and the audio accessories connected to the control boxes. Also included are procedures for troubleshooting the C-2299/VRC that may be connected to the AM-1780/VRC (items 6 and 7, *b* below).

(1) When the corrective measures given in the following chart do not clear the trouble, higher maintenance level troubleshooting is required.

b. Troubleshooting Radio-Intercom System

Item No.	Symptom	Probable causes	Corrective measures
1	Unable to communicate on intercom or radio.	*a.* Power is turned off	*a.* On AM-1780/VRC, the POWER indicator should be lighted. If not, perform the following: (1) On the AM-1780/VRC, rotate POWER indicator lens to right; set POWER CKT BKR switch to ON, MAIN PWR switch to NORM, and INSTALLATION switch to OTHER. (2) If POWER indicator is still not lighted, set the POWER switch on the receiver-transmitter connected to J501 of the AM-1780/VRC, to LOW or HIGH. The dial lamp in the receiver-transmitter should light, the transmitter should be able to be keyed, and sound should be heard from its receiver. These signs indicate that power is available to operate the radio and the radio-intercom system. (3) If the receiver-transmitter does not exhibit above signs, refer to paragraph 4-5*b* to troubleshoot the radio.
		b. Loose cable connections.	*b.* Tighten cable connections at J501 of AM-1780/VRC and at MT-1029/VRC.
		c. Defective AM-1780/VRC.	*c.* Higher maintenance level troubleshooting is required.
2	Unable to communicate on intercom or radio from one of the control boxes (other than C-2296/VRC).	*a.* Audio accessory defective or connected incorrectly.	*a.* Perform the following: (1) Substitute the original audio accessory with one known to be good. (2) Connect the original audio accessory to another control box. (3) Refer to paragraph 3-15 for instructions for connecting and using the audio accessory.
		b. Loose cable connections.	*b.* Tighten the cable connections at the control box receptacle, the vehicle receptacles, and the AM-1780/VRC.
		c. Defective control box or cable.	*c.* Higher maintenance level troubleshooting is required.
3	Unable to communicate on any radio from any control box; intercom operation is satisfactory.	*a.* Some crewmember's audio accessory is keyed on intercom, or is defective.	*a.* Perform the following: (1) Check other crewmember's audio accessories to see that one is not set to INTERCOM. (2) Disconnect cable connectors of the audio accessory of each crewmember, in turn, from the control box.
		b. Audio accessory defective or connected incorrectly.	*b.* Perform the corrective measures given in item 2*a* above.
		c. MONITOR switch not set correctly.	*c.* Set MONITOR switch to ALL or A to communicate on one receiver-transmitter; to C to communicate on second receiver-transmitter; to B to hear signals from one R-442(*)/VRC; and to C to hear signals from second R-442(*)/VRC.
		d. RAD TRANS switch on AM-1780/VRC set to LISTENING SILENCE.	*d.* Set the switch to CDR + CREW or CDR ONLY, if authorized, to enable crewmembers or crew commander, respectively, to use the receiver-transmitter.
		e. Defective radio	*e.* Refer to paragraph 4-5*b* and *c* to troubleshoot receiver-transmitter and to 4-5*e* to troubleshoot R-442(*)/VRCs.
4	Unable to communicate from C-2296/VRC (C-2297/VRC is satisfactory).	*a.* Switches are not set properly on C-2297/VRC.	*a.* Set C-2297/VRC MONITOR switch to some position other than position C and set SIG-EXT-OFF switch to EXT; indicator lamp on C-2297/VRC should light.
		b. Loose cable connections.	*b.* Perform the following: (1) Tighten cable connector at right receptacle of C-2297/VRC and at vehicle receptacle.

Item No.	Symptom	Probable cause	Corrective measures
			(2) Tighten cable connector at left receptacle of C-2296/VRC.
		c. Defective vehicle slip-ring assembly.	*c.* While rotating turret at least a quarter turn, attempt to establish contact on intercom between the C-2296/VRC and some control box inside vehicle.
		d. Defective C-2296/VRC, H-207/VRC, or slip-ring assembly.	*d.* Higher maintenance level troubleshooting required.
5	Receiver-transmitter cannot be keyed by audio accessory.	AM-1780/VRC is set up for retransmission operation of receiver-transmitters.	If authorized, set the AM-1780/VRC INSTALLATION switch from RETRANS to OTHER position.
6	Radio signals can not be heard on audio accessory connected to C-2299/VRC.	Radio reception is not available at C-2299/VRC, when it is connected to an AM-1780/VRC.	Connect audio accessory to some control box to hear radio signals.
7	Communication between individual receiver-transmitters and distant radio terminals can be accomplished but retransmission operation through the relay site radios and C-2296/VRC cannot be accomplished.	*a.* Control switch on C-2299/VRC is not set correctly.	*a.* Set the C-2299/VRC RETRANS switch to ON. The AM-1780/VRC INSTALLATION switch should also be set to RETRANS to remove control of the relay site receiver-transmitters from the crewmembers.
		b. Receiver-transmitters are not set up for squelch operation.	*b.* On each receiver-transmitter, set the SQUELCH switch to ON (OLD ON or NEW ON, as appropriate).
		c. Loose cable connections.	*c.* Tighten the connections of the cables at the C-2299/VRC receptacles and receptacles J511 and J509 on the AM-1780/VRC.
		d. Defective C-2299/VRC.	*d.* Higher maintenance level troubleshooting is required.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL PREVENTIVE MAINTENANCE

5-1. Scope of Organizational Preventive Maintenance

The following duties normally are performed by the organizational maintenance facility supporting the AN/VRC-12 series radios, and the radio-intercom system that may be used with the radios. Troubleshooting and repair instruction for organizational maintenance repairmen are provided in sections II and III, respectively.

a. Preventive maintenance procedures (para 5-2, table 5-1).

b. Lubricating parts (para 5-3).

c. Touchup painting (para 5-4).

d. Cleaning heat exchangers (para 5-5).

5-2. Preventive Maintenance, General

To insure that the radio sets and the radio-intercom system used with the radio sets are always ready for operation, they must be inspected periodically and systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary quarterly preventive maintenance checks and services to be performed are listed in table 5-1. Defects discovered during the inspection will be noted for future correction to be made as soon as the inspection is completed. Stop operation immediately if a deficiency is noted during operation which could damage the equipment. Record all deficiencies together with the corrective action taken; use DA Form 2404 (TM 38-750). Required tools are in TK-101/G (para 5-6b(1)).

Table 5-1. Organizational Preventive Maintenance Checks and Services—Quarterly Schedule

Item No.	Item to be inspected	Procedure	References
		Note Perform the following operations on those items that are applicable to the installation. For example: when radio-intercom system is not in the installation, items 13 through 17 are not required to be performed.	
		GENERAL	
1	PUBLICATIONS	Check to see that required operator and organizational maintenance manuals are on hand, including latest changes.	DA Pam 310-4 and app A.
2	EQUIPMENT MODIFICATIONS.	*a.* Check to see whether modification work orders (MWOs) that are required have been or are scheduled to be performed on radio system equipment, radio-intercom system equipment, vehicle radio installation equipment, or vehicle radio and radio-intercom system harness.	*a.* DA Pam 310-7.
		b. Check to see that the handle assemblies are installed on the plain models of the receiver-transmitters.	b. Para 1-12*b*.
		RADIO SYSTEM	
3	RECEIVER-TRANSMITTER ANTENNAS.	Perform the following: *a.* Check the case to see that the *metal* surfaces are free of rust and corrosion. Spot paint bare *metal* surfaces.	*a.* Para 5-4*a*.
		b. Bend the spring section of the matching unit and inspect the cable inside the spring. There should be no evidence of damage to the cable or the insulation on the cable.	b. Fig. 2-2.

Item No.	Item to be inspected	Procedure	References
		c. Check to see that the plastic top section of the MX-6707/VRC is not painted and that there is no evidence of hairline cracks in the plastic surface, which may be due to paint, use of improper cleaning compounds, or mounting bolts that are too tight.	*c.* A, Fig 2-1, para 5-4*a*(2).
		d. Check to see that the three setscrews at the top of the matching unit are in place and are tight.	*d.* Fig. 2-1.
		e. Check the tightness of the screws and nuts on the mounting brackets that hold the matching unit to the vehicle.	
		f. Check the matching unit screws and cable receptacles for tightness.	
		g. On the MX-6707/VRC, do not tighten the eight assembly screws (A, fig. 2-1) that hold the top plastic body to the bottom section beyond a snug tightness. Overtightening can cause hairline cracks in the plastic body. Also do not tighten the four mounting bolts beyond a snug tightness. Overtightening can cause hairline cracks in the plastic body, or loosen the helicoils that hold the four mounting bolts in some hull vehicles.	
		h. Put a small amount of silicon grease on the O-ring and on the control cable receptacle of the matching unit.	*h.* Fig 2-1, para 5-3 c.
		i. If the right-angle adapter UG-306/U is required, check to see that it is in place on the antenna cable receptacle or attached to the antenna cable CG-1773/U.	*i.* Fig. 2-5.
4	R-442(*)/VRC ANTENNA (fig 2-5 or 2-6).	Perform the following:	
		a. Clean out the mast section receptacle on the top of the mast base.	
		b. Check the mast base ceramic insulator for damage; replace base if it is damaged.	*b.* Para 2-9.
		c. On the AB-15/GR, check to see that two insulator sections are screwed tightly together over the mounting hole.	
		d. On the AB-558/GR, check to see that the mounting bolts are tight; do not tighten them beyond a snug fit.	
		e. Check the tightness of the screws and nuts on the mounting brackets that hold the mast base to the vehicle.	
		f. If the right-angle adapter UG-306/U is required, check to see that it is in place on the Adapter UG-273/U or attached to the antenna cable CG-1773/U.	
		g. Check to see that the Adapter UG-273/U is screwed tightly to the mast base receptacle.	
		h. On the AB-15/GR or AB-558/GR, check to see that the grounding clamp is intact and that it is locked to the UG-273/U.	h. Fig. 2-5, or 2-6.
5	AUDIO ACCESSORIES	Perform the following:	
		a. Put a light coat of silicone grease on the O-rings in the cable connectors.	*a.* Para 5-3c; fig. 2-19.
		b. Replace audio accessories in which cable insulation or any parts are broken.	
		c. Check the accessory connector for the following:	*c.* Fig. 2-19.
		(1) The gland nut is tight (not provided on some connectors).	
		(2) The spring-loaded connector pin assembly appears to be in proper position and is not loose. Check its spring action by pressing down on it.	
		(3) Check to see that three small keys are not broken or worn down.	
6	RECEIVER-TRANSMITTER.	d. Repair, clean CVC helmet as required.	d. TM 10-8400-201-23.
		Perform the following:	
		a. Check the outside surfaces to see that the metal surfaces are free of rust and corrosion. Spot-paint bare *metal* surfaces.	*a.* Para 5-4*a*.

Item No.	Item to be inspected	Procedure	References
		b. If the radio is used in open vehicles and exposed continually to the sun, check to see whether the top, back, and sides are painted with sun-reflecting paint.	*b.* Para 5-4*b*.
		c. Tighten all screws on covers, sides, and controls. Replace missing screws.	
		d. Check to see that the CALL indicator lens cap and lamp are in place. Whether the lamp is good is determined during squelch operation of the equipment.	*d.* Fig. 3-1 or 3-3.
		e. Check to see that the dial lamp and its holder are in place. Whether the lamp is good is determined when the radio is turned on.	*e.* Fig. 3-1 or 3-3.
		f. Check to see that the protective nut is in place on the ANT receptacle and is locked tight.	*f.* Fig. 3-1 or 3-3.
		g. Check the ANT receptacle to see that it is not so damaged that the antenna cable CG-1773/U cannot be locked onto the receptacle.	*g.* Fig. 3-1 or 3-3.
		h. If right-angle adapter UG-306/U is required, check to see that it is in place on the ANT receptacle or attached to the antenna cable CG-1773/U.	*h.* Fig. 2-5.
		i. Clean the heat exchanger. This operation is optional: (1) In dusty areas, the cleaning should be performed more often than quarterly. (2) In dry, cold, or non-dusty areas, this operation may be performed at quarterly intervals.	*i.* Para 5-5.
7	R-442(*)/VRC	Perform the following:	
		a. Check the outside surfaces to see that the metal surfaces are free of rust and corrosion. Spot-paint bare *metal* surfaces.	*a.* Para 5-4*a*.
		b. If the receiver-transmitter is used in open vehicles and exposed continually to the sun, check to see whether the top, back, and sides are painted with sun-reflecting paint.	*b.* Para 5-4*b*.
		c. Tighten all screws on covers, sides, and controls. Replace missing screws.	
		d. Check to see that the CALL indicator lens cap and lamp are in place. Whether the lamp is good is determined during squelch operation of the equipment.	*d.* Fig. 3-4.
		e. Check the ANT receptacles to see that they are not so damaged that the antenna cable (or cables) cannot be locked onto the receptacle.	
		f. If the right-angle adapter UG-306/U is required, check to see it is in place on the ANT receptacle or attached to the antenna cable CG-1773/U.	*f.* Fig. 2-5.
		g. Check to see that the dial lamp and its holder are in place. Whether the lamp is good is determined when the radio is turned on.	*d.* Fig. 3-4.
8	MT-1029/VRC AND MT-1898/VRC.	Perform the following:	
		a. Check the surfaces to see that they are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.
		b. Check to see that all screws holding the radio mount to the vehicle and those on the mount are screwed tightly.	
9	MX-7778/GRC	Perform the following:	
		a. Check the surfaces to see that they are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.
		b. Check to see that all screws and mounting bolts are tight.	
		c. Check to see that the cable receptacle locknuts are not loose. Tighten locknuts with a spanner wrench.	*c.* fig. 2-18, 2-19.
10	C-2299/VRC (fig. 3-9)	Perform the following:	
		a. Check the surfaces to see that they are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.

Item No.	Item to be inspected	Procedure	References
		b. Check to see that all screws and mounting bolts are tight.	
		c. Check to see that the audio accessory and cable receptacle locknuts are not loose (fig 3-15). Tighten locknuts with spanner wrench.	*c.* Fig. 2-18, 2-19.
11	C-2742/VRC (fig. 3-10)	Perform the following:	
		a. Check the surfaces to see that they are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.
		b. Check to see that all screws and mounting bolts are tight.	
		c. Check to see that the audio accessory and cable receptacle locknuts are tight (fig 3-15). Tighten with a spanner wrench.	*c.* Fig. 2-18.
		d. Check to see that the CONTROL indicator lens cap can be rotated to its two positions and that the lens cap is not loose. Whether the lamp is good is determined during operation of the control box.	
12	RADIO SYSTEM CABLING.	Perform the following:	
		a. Check to see that all radio system interconnecting cables are not damaged, and that they are fully locked to the equipment receptacles.	
		b. Check to see that the cable connector locknuts are tight. Tighten locknuts with spanner wrench.	*b.* Fig. 2-19.
		c. If cable guards or brackets are provided in the installation, check to see that they are in place and that all mounting screws are in place and screwed tightly.	
		d. Check to see that all cable clamps are in place, that they hold the cables securely, and that the cable clamp bolts are screwed tightly to the vehicle.	
		RADIO-INTERCOM SYSTEM	
13	AM-1780/VRC (fig. 3-5)	Perform the following:	
		a. Check the outside surfaces to see that the metal surfaces are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.
		b. Tighten cover, controls, and mounting screws. Replace missing screws.	
		c. Check to see that the POWER indicator lens cap can be rotated to its two positions and that the lens cap is not loose. Whether the lamp is good is determined during operation of the AM-1780/VRC.	
		d. Check to see that the locknuts of each receptacle is tight and that the cable connectors are positioned at the right angle in the receptacles.	*d.* Fig. 2-18, 2-19.
		e. Check to see that dust covers are on unused receptacles.	*e.* Fig 2-18.
		f. Check to see that the binding post are not damaged and are not loose.	
14	CONTROL BOXES C-2298/VRC AND C-2297/VRC (fig 3-8 and 3-7).	Perform the following:	
		a. Check the outside surfaces to see that the metal surfaces are free of rust and corrosion. Spot-paint bare metal surfaces.	*a.* Para 5-4*a*.
		b. Tighten cover, control, and mounting screws. Replace missing screws.	
		c. On the C-2297/VRC, check to see that the indicator lens cap can be rotated to its two positions and that the lens cap is not loose. Whether the lamp is good is determined during operation of the C-2297/VRC.	
		d. Check to see that the locknuts of the audio and cable receptacles are not loose. Tighten locknuts with a spanner wrench.	*d.* Fig. 3-15.
15	C-2296/VRC (fig. 3-6)	Perform the following:	
		a. Check the outside surfaces to see that the metal sur-	*a.* Para 5-4*a*.

No. Item	Item to be inspected	Procedure	References
		faces are free of rust and corrosion. Spot-paint bare metal surfaces. *b.* Tighten cover, control, and mounting screws. Replace missing screws. *c.* Check the H-207/VRC for damage to the case, switch, or retractile cable. *d.* Check the call indicator lens assembly to see that it is not damaged and that it is secured firmly to the box on the vehicle. Whether the lamp is good is determined during operation of the C-2296/VRC.	
16	C-2299/VRC (connected to AM-1780/VRC) (fig. 3-9).	Perform the following: *a.* Check the surfaces to see that they are free of rust and corrosion. Spot-paint bare metal surfaces. *b.* Check to see that all screws and mounting bolts are tight. *c.* Check to see that the audio accessory and cable receptacle locknuts are not loose. Tighten locknuts with spanner wrench.	*a.* Para 5-4*a*. *c.* Fig. 3-15.
17	RADIO-INTERCOM SYSTEM CABLING.	Perform the following: *a.* Check to see that all radio-intercom system interconnecting cables are not damaged, and that they are fully locked to equipment receptacles. *b.* Check to see that the cable connector locknuts are tight. Tighten locknuts with spanner wrench. *c.* Check to see that all cable clamps are in place, that they hold the cables securely, and that the cable clamp bolts are screwed tightly to the vehicle. *d.* Check to see that cable connectors are labeled.	*b.* Fig 2-19. *d.* Para 2-13a(2).

5-3. Using Lubricants on Connecting Surfaces

There are two kinds of lubricants that can be used on the surfaces of the equipment. One is used on the whip antenna sections to prevent them from seizing (*b* below); the other is used on surfaces of preformed packing in the covers of equipment and the O-rings on connectors (*c* below).

a. Lubricants. Following are typical lubricants that may be used for the purposes given in *b* and *c* below.

(1) Grease, Graphite; Federal stock No. 9150-753-4648.

(2) Insulating Silicon Compound; Federal stock No. 6850-880-7616.

b. Lubricating Whip Antenna Sections. To facilitate separating the whip antenna sections of the AS-1729/VRC and AT-912/VRC, and the radio receiver antenna elements MS-116A, MS-117A, and MS-118A, and to prevent the sections from locking together (seizing) due to corrosion or similar action, use graphite grease (*a*(1) above). Clean the threads of the antenna sections and antenna elements. Put a thin coat of the graphite grease on the threads of the male antenna sections and elements; do not put the grease on the female sections and elements.

c. Lubricating Preformed Packing and O-Rings.

(1) Typical examples of preformed packing are found embedded in the top and bottom covers of the radios and controls boxes of the radio-intercom system. Gaskets used in installation may also be coated with the insulating silicon compound.

(2) Typical examples of O-rings are found in audio accessory cable connectors (fig. 2-19), below the contact on the top of the antenna matching units (fig. 2-1), the outer shell on the control cable receptacles on the matching units and receiver-transmitters (fig. 3-1 and 3-3, ANT CONT receptacle).

(3) Before applying a thin film of the insulating silicon compound (*a*(2) above) to the surface of the O-ring, preformed packing, or gasket, clean the surface.

CAUTION

Do not let the insulating silicon compound touch electrical contacts.

5-4. Painting

a. Touchup Painting of Bare Metal Surfaces.

(1) Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable painting and refinishing instructions given in SB 11-573, TB 746-10.

(2) Under no condition should the plastic body of the MX-6707/VRC (fig. 2-1) be painted; nor should the surface be cleaned with other than clear water. If the vehicle is to be painted, remove the MX-6707/VRC. If the plastic body was painted or is covered with spray from a nearby paint spray gun, do not attempt to remove the paint. The paint remover solvent would cause more damage to the plastic.

b. Heat-Reflecting Paint. Heat-reflecting paint should be applied to the receiver-transmitters and R-442(*)/VRC that are used in open vehicles which are continually exposed to the sun. The application of the paint should be performed by higher maintenance facilities.

5-5. Cleaning Heat Exchanger of Receiver-Transmitter (fig. 5-1)

Dust and dirt become encrusted on the surfaces of the heat exchangers and power transistor assembly thus forming an insulation that prevents efficient dissipation of the heat from the units. Accordingly, the surfaces must be cleaned periodically; at least weekly in dusty areas, and monthly or quarterly in dry, cold, and non-dusty areas. To perform the operation, follow the procedures in *a*, *b*, and *c* below.

a. Remove the rear and sides plates from the heat exchangers. Do not remove the top cover of the receiver-transmitter. To do so would permit the dirt removed from the heat exchanger surfaces to get inside the radio.

b. Use a stiff-haired brush to loosen the dust and dirt from the surfaces of the heat exchangers and the power transistor assembly. Use a tooth brush to remove the dirt from the vanes of the blower motor. Use a soft-haired brush to remove the loosened dirt.

c. Replace the rear and side plates on the heat exchangers.

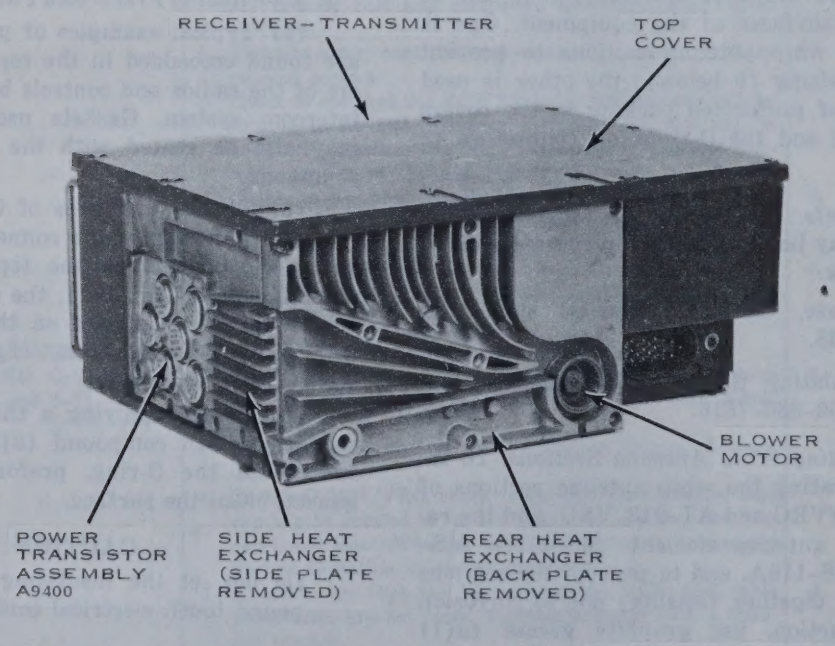


Figure 5-1. Heat exchanger and power transistor assembly of receiver-transmitter.

Section II. TROUBLESHOOTING

5-6. General

a. When troubleshooting procedures identify a piece of equipment as defective, it is either referred to the organizational maintenance facilities for repair or submitted to higher maintenance level for repair.

b. The following equipment is required to troubleshoot and repair the equipment.

(1) Tool Kit, Electronic Equipment TK-101/G.

(2) Multimeter AN/URM-105 (TM 11-6625-203-12).

(3) Test Set, Radio Frequency AN/VRM-1(*) (TM 11-6625-496-12). (AN/VRM-1(*) represents all models of the test set.)

c. Refer to paragraph 5-12 for repair and radio handling procedures.

5-7. Using Test Set, Radio Frequency Power TS-2609/U to Measure Output Power of Receiver-Transmitters (fig. 5-2)

The TS-2609/U is a thru-line directional wattmeter which measures and monitors transmitter radiofrequency (RF) power and load match (reflected power) in 50-ohm impedance coaxial systems. It measures forward and reflected power from 0 to 10 watts and 0 to 100 watts in 30.00 to 76.00 MHz range with an accuracy to 5 percent of full scale at room temperature. It provides no loss to transmitted and received RF signals. Thus, it may be connected to the radio during normal transmission and reception.

a. Connections.

(1) Connect the TS-2609/U to the ANT receptacle of the receiver-transmitter. Connect the antenna cable from the antenna matching unit or other antenna to the load side of the TS-2609/U. The TS-2609/U may be clamped to the handle or guard of the receiver-transmitter.

(2) To obtain true power indications, the antenna must not be tied down and both antenna sections must be assembled and mounted on the matching unit which, in turn, should be mounted in the vehicle with the radio.

(3) The control cable, CX-4722/VRC, should also be connected between the receiver-transmitter and the matching unit. This is to insure that the proper network in the matching unit has been automatically selected by the frequency tuning circuits of the receiver-transmitter. If the MX-6707/VRC is being used without the CX-4722/VRC, the proper network can be selected by setting the MX-6707/VRC band control (fig. 2-1) to the position that includes the receiver-transmitter frequency.

b. Procedure.

(1) *Using TS-2609/U.* To obtain power indications on the TS-2609/U, key the receiver-transmitter. The indications obtained are unaffected by a person speaking on the radio. When the power indication is less than 10 watts (forward or reflected power), set the spring-loaded switch on the TS-2609/U to 10 position to read the power indication on the 1 to 10 scale of the meter. Use the chart in (2) below for minimum forward power indications; use the chart in (3) below for maximum reflected power indications.

(2) *Minimum forward power requirements.*

Receiver-transmitter POWER switch setting	Forward power indication	Power source (dc) [a]
LOW	0.5 to 8 watts	25.5 volts
	0.5 to 10 watts	30.0 volts
HIGH	35 watts, min	25.5 to 30.0 volts

[a] When a power supply, such as the PP-2953(*)/U is used, it will be noted that these power source voltages are based on the condition that the receiver-transmitter is keyed in transmit mode. Unless the power source is well regulated, it may drop below the voltage to which it was adjusted during receive mode after the transmitter is keyed.

(3) *Reflected power indications.* The reflected power indications in the chart below, which are applicable to the AS-1729/VRC (and AT-912/VRC) antenna systems, are based on a voltage standing-wave ratio (swr) of 4, plus 5 percent for maximum meter error. When another antenna system is connected to the radio, the allowable voltage swr for it must be known, then converted to the reflecting power indication for each forward power indication. The graphs provided for the TS-2609/U in TM 11-6625-1686-15 may be used for this purpose. If a 50-ohm dummy load, such as Dummy Load, Electrical DA-75/U, is used to terminate the thru-line TS-2609/U instead of an antenna system, the reflected power indications should be almost zero for any forward power indication. The power indications obtained also vary with the frequency being transmitted. When the reflected power is the same as the forward power, there is an opening in the transmission line beyond the TS-2609/U.

Transmitter power level	Forward power (watts)	Maximum reflected power (watts)
LOW	1.0	Less than 0.5
	1.5	0.50
	2.0	0.75
	2.5	0.90
	3.0	1.00
	3.5	1.25
	4.0	1.50
	4.5	1.75
	5.0	2.00
	5.5	2.25
	6.0	2.45
	6.5	2.60
	7.0	2.75
	7.5	2.90
	8.0	3.10
HIGH	35.0	13.0
	40.0	14.75
	45.0	16.80
	50.0	18.90
	55.0	21.00
	60.0	22.00
	65.0	23.0
	70.0	26.25
	75.0	26.50
	80.0	27.30

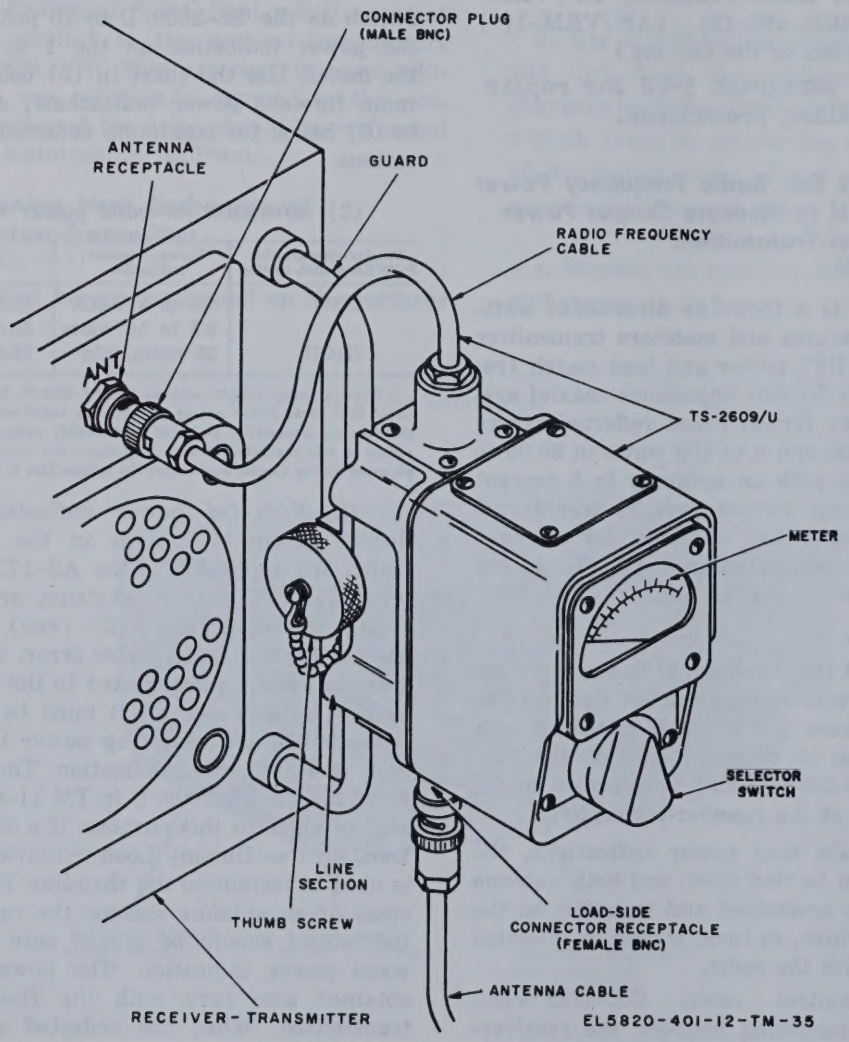


Figure 5-2. TS-2609/U connected to receiver-transmitter.

c. Troubleshooting Procedures.

(1) When the minimum forward power indication is not obtained, disconnect the antenna system cable and measure forward power again. If the minimum indication is not obtained, the transmitter section of the receiver-transmitter is defective. Refer to paragraph 5–11 for procedures to check the transmitting circuits.

(2) When the maximum reflected power indications are exceeded, some part in the antenna system may be defective; proceed as follows:

(*a*) Check the operation of the antenna matching unit by changing the receiver-transmitter BAND switch and also change the MC control to a number of frequencies at least 10 MHz apart. At each change in the BAND switch and the MC control, the relays in the matching unit should be heard operating. If they are not heard, CX–4722/VRC may be defective; replace it. If that does not help, replace the original CX–4722/VRC and replace the matching unit with one known to be good. If these operations do not help, higher maintenance level repair is required to troubleshoot the antenna control circuits of the receiver-transmitter.

(*b*) Replace the antenna sections, one at a time.

5–8. Radio System Equipment Performance Requirements

Use the following procedures to check the performance of the indicated equipment before and after it has been repaired for malfunction. When normal indications are not obtained, refer to applicable troubleshooting procedures (para 5–11). The radio equipment must be completely connected for normal operation in its own particular configuration in the vehicle.

a. Receiver-Transmitter and Antenna Performance Tests. Remove the antenna tie-down assemblies. If available, TS–2609/U (para 5–7) may be used to check forward and reflected power (steps 5,6). Use a nearby radio, identified as the local receiver-transmitter in these procedures, for communication checks with the receiver-transmitter under test. Connect proper audio accessories to the audio receptacles of the receiver-transmitter.

Step No.	Action	Normal indication
1	Set the following: POWER switch: LOW SQUELCH switch: NEW OFF LIGHT switch: ON SPKR switch: ON BAND, MC, and KC controls: assigned frequency VOLUME control: midrange	*a.* Dial lamp should light. *b.* Rushing noise should be heard. *c.* Adjustment of VOLUME control changes the rushing noise loudness.
2	Key the radio.	*a.* Rushing noise should stop. *b.* Blower motor should run.
3	Key the radio and talk into the microphone.	*a.* Same indications as step 2. *b.* Sidetone should also be heard.
4	Set SQUELCH switch to NEW ON and repeat step 3.	*a.* Rushing noise should stop when SQUELCH switch is set to ON. *b.* CALL lamp should light and same indications given for step 3 should be obtained.
5	If available, connect TS–2609/U between receiver-transmitter and antenna matching unit (fig. 5–2). Key the receiver-transmitter.	The TS–2609/U should indicate required forward and reflected power indications (para 5–7*b*).
6	Set the POWER switch to HIGH and key the receiver-transmitter.	The TS–2609/U should indicate required forward and reflected power indications (para 5–7*b*).
7	Set the POWER switch to LOW. Key the receiver-transmitter and talk to the local receiver-transmitter, which is set to receive 150-Hz squelch tone.	The signal should be received loud and clear by the local receiver-transmitter.
8	Listen to the reply from the local receiver-transmitter. Adjust the VOLUME control as required.	The CALL lamp should light when the local receiver-transmitter is keyed; and the signal should be heard clearly.

Step No.	Action	Normal indication
9	Set the local receiver-transmitter SQUELCH switch to NEW ON.	
	On the receiver-transmitter under test, set the SQUELCH switch to NEW ON, NEW OFF, and OLD OFF, in turn. At each position, key the receiver-transmitter.	At each position of the SQUELCH switch of the receiver-transmitter under test, the CALL lamp on the local receiver-transmitter should light (indicating the 150-Hz squelch tone is being transmitted).
10	Using some convenient MC frequency, set the KC control to each position between 00 and 95. At each position, perform transmission and reception check with the local receiver-transmitter.	At each KC position, satisfactory communication should be established.
11	Change to a frequency in the other band (B or A) and perform a transmission and reception check with the local receiver-transmitter. Check the forward and reflected power indications on TS-2609/U, if available.	*a.* Satisfactory communication should be established. *b.* The forward and reflected power indications should be within limits (para 5-7*b*).
12	At each of the MC control positions listed below, listen for the operation of relays in the antenna matching unit. Simultaneously key the radio and observe the forward and reflected power indication on the TS-2609/U, if available. *a.* 30 MHz. *b.* 34 MHz. *c.* 38 MHz. *d.* 45 MHz. *e.* 50 MHz. *f.* 54 MHz. *g.* 57 MHz. *h.* 62 MHz. *i.* 67 MHz. *j.* 72 MHz.	*a.* At each MC control setting, relays in the antenna matching unit should be heard operating. *b.* Minimum forward power and maximum reflected power indications should be obtained (para 5-7*b*).
	Caution Do not key the radio while changing MC or BAND switches.	
		(*Following operations apply to the RT-246(*)/VRC.*)
13	Depress No. 1 pushbutton. Set the BAND switch to AUTO.	The automatic tuning mechanism should operate to set up a frequency which will be seen fixed in the dial window.
14	In turn, push each of the remaining pushbuttons.	As each pushbutton is depressed, the preceding pushbutton should jump out, and another frequency should be set up in the dial window.
15	If the C-2742/VRC is used with the RT-246(*)/VRC, perform the tests given in *b* below.	

b. C-2742/VRC Performance Tests

Step No.	Action	Normal indication
1	Turn on the RT-246(*)/VRC and test the pushbutton circuits. Refer to steps 1, 13 and 14 in *a* above.	Normal automatic tuning is obtained.
2	On C-2742/VRC, set the CHAN SEL switch to position 1 and the POWER switch to LO.	None.

Step No.	Action	Normal indication
3	On the RT–246(*)/VRC, depress pushbutton No. 1, set the BAND switch to AUTO, and the POWER switch to REMOTE.	The CONTROL lamp on the C–2742/VRC should light. If not, momentarily operate the control switch (SW) on the C–2742/VRC.
4	Rotate the C–2742/VRC CHAN SEL switch to each position, in turn.	At each position, the RT–246(*)/VRC automatic tuning mechanism should operate to set up a frequency which will be seen in the dial window.
5	Set the C–2742/VRC PWR switch to HI. Check the radio output by keying and observing TS–2609/U indication.	The RT–246(*)/VRC control mechanism should set the radio at high transmitting power (35 watts, minimum).
6	Set the C–2742/VRC PWR switch to OFF, wait a few seconds, then reset to LOW.	On the RT–246(*)/VRC the dial light and the C–2742/VRC CONTROL indicator lights should go out, indicating power has been turned off. When the switch is set to LOW, the lights should go on again.
7	When a second C–2742/VRC is used, momentarily operate its control switch (SW).	The CONTROL indicator on the first C–2742/VRC should go out and the one on the second C–2742/VRC should light.
8	Repeat tests in steps 4 and 5 on the second C–2742/VRC.	The same indications should be obtained on the second C–2742/VRC. (The second C–2742/VRC cannot turn off the radio (step 6 above).)

c. C–2299/VRC and Retransmission Performance Tests. The following tests are performed on C–2299/VRC connected directly to the receiver-transmitter or to the AM–1780/VRC. The operations check the performance of the C–2299/VRC and also the retransmission functions of receiver-transmitters used with the C–2299/VRC.

Step No.	Action	Normal indication
1	On C–2299/VRC, set RAD TRANS switch to OFF. Connect an audio accessory to the C–2299/VRC when it is used directly with the receiver-transmitter(s). Follow the procedures in steps 2 through 5 below. However, when the C–2299/VRC is connected to the AM–1780/VRC, the audio accessory must be connected to a control box in the radio-intercom system. Follow the procedures in steps 6 through 8 below.	
2	Turn on and test associated receiver-transmitter(s). Use the procedures in steps 1 through 9 in *a* above. Establish a different operating frequency for each receiver-transmitter when there are two of them.	When there are two receiver-transmitters, each one must be capable of communication in squelch mode (a requirement for retransmission operation). When there is only one receiver-transmitter, it must be capable of satisfactory radio communication with the local receiver-transmitter. In this instance, the C–2299/VRC will be tested for control of the receiver-transmitter (step 3 below) and not for retransmission function.
3	Set C–2299/VRC RAD TRANS switch to position 1. Communicate with the distant radio station.	Receiver-transmitter connected to receptacle J701 of C–2299/VRC should operate as follows: *a.* On transmission, blower motor should run and sidetone should be heard. *b.* On reception, signal from distant radio should be heard, and the VOLUME control on the C–2299/VRC should control the level of the signal smoothly.
4	Set C–2299/VRC RAD TRANS switch to position 2. Communicate with the distant radio station.	Receiver-transmitter connected to receptacle J702 of C–2299/VRC should operate: transmission and reception indications given in step 3 above should be obtained.

Step No.	Action	Normal indication
5	Advise the operators of the distant radios that the next communication will be conducted between them; then set C-2299/VRC RETRANS switch to ON.	*a.* When C-2299/VRC RAD TRANS switch is set to positions 1 and 2, the associated receiver-transmitter cannot be keyed from the audio accessory connected to C-2299/VRC. *b.* When the signal is received at the receiver-transmitter connected to J701 of C-2299/VRC, the following should occur: On the receiver-transmitter, the CALL lamp should light, the signal should be heard at the C-2299/VRC when the RAD TRANS switch is set to position 1, and the blower motor in the other receiver-transmitter should be heard (indicating it is transmitting). *c.* When the signal is received at the receiver-transmitter connected to J702 of C-2299/VRC, similar actions should occur: On the receiver-transmitter, the CALL lamp should light, the signals should be heard at the C-2299/VRC when the RAD TRANS switch is set to position 2, and the blower motor in the other receiver-transmitter should be heard. *d.* Satisfactory reception should be obtained by each of the distant radios.
6	Perform the operations given in step 2 above. Use an audio accessory connected to one of the control boxes in the radio-intercom system.	Both receiver-transmitters must be capable of communication in squelch mode (a requirement for retransmission operation).
7	Advise the operators of the distant radios that the next communication will be conducted between them; then set C-2299/VRC RETRANS switch to ON.	*a.* When the signal is received on one receiver-transmitter, its CALL lamp should light and the blower motor in the other receiver-transmitter should be heard. *b.* When the signal is received on the other receiver-transmitter, its CALL lamp should light and the blower motor in the other receiver-transmitter should be heard. *c.* Signals passing between the two receiver-transmitter should be heard when the MONITOR switch on the control boxes is in ALL position. *d.* Also, signals received on the first receiver-transmitter (*a* above) should be heard on the A position of the MONITOR switch. Similarily, signals received on the second receiver-transmitter (*b* above) should be heard on C position of the MONITOR switch. *e.* Keying either receiver-transmitter can still be accomplished, but this is prevented by the next operation.
8	On AM-1780/VRC, set the INSTALLATION switch to RETRANS.	Retransmission operation between the distant radios (step 7 above) is unaffected. However, signals of either transmission can still be monitored on the ALL position of the control box MONITOR switch. Neither receiver-transmitter can be keyed, however.
9	If retransmission operation is no longer required, reset AM-1780/VRC INSTALLATION switch to OTHER.	

d. R-442(*)/VRC Performance Tests. Use a nearby radio, identified as a local receiver-transmitter in following procedures, for communication checks with the R-442(*)/VRC under test. Connect audio accessories to the front panel AUDIO receptacles.

Step No.	Action	Normal indication
1	Set the following: LIGHT switch: ON SQUELCH switch: NEW OFF BAND, MC, and KC controls: assigned frequency POWER: ON	*a.* Dial lamp should light. *b.* Rushing noise should be heard. *c.* Adjustment of VOLUME control changes the rushing noise loudness.
2	A signal from the local receiver-transmitter should be transmitted.	The rushing noise should stop and the received signal should be heard loud and clear.

Step No.	Action	Normal indication
3	Set the SQUELCH switch to NEW ON. A signal from the local receiver-transmitter should be transmitted.	*a.* Rushing noise should stop and no sound should be heard when the switch is set to NEW ON. *b.* CALL lamp should light and received signal should be heard loud and clear.

5–9. Troubleshooting Equipment of Radio System

a. General. The following procedures for locating troubles in equipment in the radio system apply whether the radio system is used with the radio-intercom system or is used without it. When radio communication failures occur while operating the radios from the radio-intercom system control boxes, refer to paragraph 5–10. After performing each corrective measure given in the troubleshooting charts, check the equipment performance to determine whether normal operation is restored.

b. Troubleshooting RT–524(*)/VRC in System. Use the following procedures when trouble occurs in the RT–524(*)/VRC connected to the radio system. Troubleshooting the RT–524(*)/VRC separated from the radio system is provided in paragraph 5–11. When there are two RT–524(*)/VRC's in the radio system, one is identified as "A" radio receiver-transmitter, the second one as "B" radio receiver-transmitter. Before proceeding, perform the operations in the operator's troubleshooting procedures (para 4–5). For troubles other than those symptoms specified in the following chart, refer to paragraph 5–11 to troubleshoot the RT–524(*)/VRC. Refer to figures FO–2 through FO–5 for power and signal circuits of radio and radio-intercom systems.

Item No.	Symptom	Probable troubles	Corrective measures
1	No sound is heard; blower motor does not run when radio is keyed; dial lamp is not lighted.	*a.* Radio is turned off	*a.* Perform the following: (1) On receiver-transmitter, set POWER switch to OFF BREAKER RESET position, then back to LOW. Dial lamp should light indicating power is available. (2) If provided, set the AM–1780/VRC MAIN PWR switch to NORM and the "A" radio receiver-transmitter POWER switch to LOW. Also, if the defective receiver-transmitter is the "B" radio, also set the POWER switch in the "B" radio receiver-transmitter to LOW. (3) If provided, set the ON-OFF switch on the MX–7778/GRC to ON. (4) If the vehicle has a master switch, set it to ON.
		b. Defective power cables or MT–1029/VRC.	*b.* Perform the following: (1) If the MT–1029/VRC was just changed, check to see that the link in the junction box is positioned properly (fig. 2–11). Also spread the pins of the fuse link slightly. (2) Check the power cable connections at the battery terminals (fig. 2–15). Also check to see that the negative terminal of the vehicle battery is connected to the engine chassis. (3) Measure the voltage at the battery terminals; it should be approximately 26 volts. When the vehicle engine is running, the voltage should be higher. (4) Measure the voltage at pins A (negative) (ground) and B of the radio receptacle (J24) on MT–1029/VRC junction box. The voltage should be the same as the battery voltage ((3) above). (5) If no voltage is obtained, open the junction box and spread the pins of the fuse link slightly (fig. 2–11), replace the cover, and check the volt-

Item No.	Symptom	Probable troubles	Corrective measures
			age again ((4) above). (6) If voltage is obtained, receiver-transmitter is defective; refer to paragraph 5–11 for troubleshooting procedures. (7) If no voltage is obtained, disconnect the power cable connected to main power receptacle (J21) and measure the voltage at conductor pins A (negative; ground) and B (positive); it should be the same as the battery voltage ((3) above). (8) If the voltage is obtained, the MT–1029/VRC is defective; refer the unit to higher maintenance level for repair. (9) If the voltage is not obtained, replace the power cable.
		c. Defective receiver-transmitter.	*c.* Refer to paragraph 5–11 to troubleshoot the receiver-transmitter.
2	When the radio is keyed, blower motor runs and sidetone is heard. Reply from distant radio is not heard.	*a.* Defective antenna system.	*a.* Perform the following: (1) Check the tightness of CG–1773/U and CX–4722/VRC at the radio and the antenna. (2) Inspect the spring-loaded contact inside the bottom of the AS–1729/VRC (or AT–1096/VRC) (fig. 2–1). Replace the antenna section if the contact is damaged or does not spring back after it is depressed. (3) Remove the CX–4722/VRC and check the connectors to see that all pins are straight and none are missing. Replace the cable if a connector is defective. Straighten bent pins. (4) Listen for clicking of relays in the antenna matching unit while rotating the MC control on the receiver-transmitter to frequencies at least 10 MHz apart. On the MX–6707/VRC, the band control (fig. 2–1) should stop at positions that include the selected frequencies. When relay operation cannot be detected, CX–4722/VRC, matching unit, or receiver-transmitter is defective. Perform checks in (5) below. (5) Tune the radio to the following frequencies and check the battery voltage at indicated pins. First check pins at front panel ANT CONT receptacle. If readings are not obtained, receiver-transmitter is defective; if readings are obtained, reconnect CX–4722/VRC to ANT CONT receptacle and check the same pins on the open end connector of the CX–4722/VRC. If readings are not obtained, replace the cable; if readings are obtained, the matching unit is defective.

Radio control position	*Connector pin (read battery voltage)*
	N
BAND sw: A MC control:	A
32	D
34	E
38	F
45	H
48	J
BAND sw: B MC control:	B
54	D
58	E
62	F
68	H
72	J

Item No.	Symptom	Probable troubles	Corrective measures
		b. Defective receiver-transmitter.	*b.* Refer to paragraph 5-11 to troubleshoot the receiver-transmitter. NOTE If available, Connect the TS-2609/U between the receiver-transmitter and the antenna system (fig. 5-2). Refer to paragraph 5-7 and check the output and reflected power as indicated and perform indicated troubleshooting procedures if necessary.
3	Received signals can be heard on loudspeaker on radio but not on external loudspeaker.	Defective external loudspeaker.	Perform the following: *a.* If an extension cable, CX-7867/U is used (fig. 3-13), remove it and connect the loudspeaker directly to SPKR receptacle. *b.* If signal is heard, replace extension cable. If signal is not heard, replace external loudspeaker.

c. Troubleshooting RT-246(*)/VRC and C-2742/VRC. For communication failures with the RT-246(*)/VRC, use the same troubleshooting procedures given in *b* above for the RT-524(*)/VRC. For pushbutton tuning troubles, refer the RT-246(*)/VRC to higher maintenance level for repair. For troubles with the C-2742/VRC used with the RT-246(*)/VRC, use the procedures in the following chart. The procedures apply whether there are one or two C-2742/VRC's used with the radio. For troubles in the RT-246(*)/VRC other than those symptoms given in *b* above, refer to paragraph 5-11 to troubleshoot the RT-246(*)/VRC. Before proceeding, perform the operations given in the operator's troubleshooting procedures (para 4-5*c*).

Item No.	Symptom	Probable troubles	Corrective measures
	Unable to control power or change frequencies on RT-246(*)/VRC from C-2742/VRC.	*a.* Defective cables	*a.* Perform the following after it has been established that pushbutton tuning can be accomplished using RT-246(*)/VRC pushbuttons, indicating that the radio control circuits are operative. (1) Replace cable connected between RT-246(*)/VRC and C-2742/VRC. (2) When a second C-2742/VRC is used, replace the cable connected between the two control boxes.
		b. Defective C-2742/VRC.	*b.* Replace C-2742/VRC. Higher maintenance level repair is required.

d. Troubleshooting R-442(*)/VRC in System. Use the following procedures when trouble occurs in the R-442(*)/VRC connected to the radio system. Troubleshooting the R-442(*)/VRC separated from the radio system is provided in paragraph 5-11. When there are two R-442(*)/VRC's in the radio system, one is identified as "B" receiver and the second as "C" receiver. For troubles in the R-442(*)/VRC other than those specified in the following chart, refer to paragraph 5-11. Before proceeding, perform the operations in the operator's troubleshooting procedures (para 4-5*e*).

Item No.	Symptom	Probable troubles	Corrective measures
1	No sound is heard; dial lamp does not light.	*a.* Radio is turned off	*a.* Perform the following: (1) On R-442(*)/VRC, set POWER switch to OFF then to ON-RESET. Dial lamp should light, indicating power is available. (2) If provided, set the AM-1780/VRC MAIN PWR switch to NORM and the associated receiver-transmitter POWER switch to LOW. (3) If provided, set the ON-OFF switch on the MX-7778/GRC to ON. (4) If vehicle has a master switch, set it to ON.

Item No.	Symptom	Probable troubles	Corrective measures
		b. Defective power cables or radio mount.	b. Perform the following: (1) If the MT-1898/VRC was just changed, check to see that the link in the junction box is positioned properly (fig. 2-12). Also spread the pins of the fuse link slightly. (2) Make the following checks: (*a*) Check to see that the battery voltage (approximately 26 volts dc) is obtained at pins A (neg) and B (pos) of radio receptacle (J11) of MT-1898/VRC junction box. (*b*) If the AM-1780/VRC is in the system, check procedures in *a*(2) above. Check to see that the battery voltage is obtained at pins A (neg) and C (pos) of radio receptacle J11. (*c*) If either of the above are not obtained, replace the following, in turn: power cable CX-4721/VRC between MT-1898/VRC under test and preceeding radio mount; preceeding radio mount; MT-1898/VRC under test.
		b. Defective R-442(*)/VRC.	b. Refer to paragraph 5-11 to troubleshoot the R-442(*)/VRC.
2	Rushing noise is heard; signals from distant radio cannot be heard.	a. Defective antenna system.	a. Check the tightness of the CG-1773/U connectors at the R-442(*)/VRC and the antenna mast base.
		b. Defective R-442(*)/VRC.	b. Refer to paragraph 5-11 to troubleshoot the R-442(*)/VRC.

e. Troubleshooting C-2299/VRC in Radio System. Use the following procedures when trouble occurs with the C-2299/VRC connected to the receiver-transmitter either as a convenient connecting facility for audio accessories or as part of the retransmission configuration (AN/VRC-49, AN/VRC-45, AN/VRC-54, or AN/VRC-55). Refer to step 8, paragraph 5-10b for troubles with radio retransmission when the C-2299/VRC is connected to the AM-1780/VRC in the radio-intercom system. Before proceeding, perform the operator's troubleshooting procedures in paragraph 4-5*d*. Refer to figure FO-7 for signal circuits of retransmission configuration.

Item No.	Symptom	Probable troubles	Corrective measures
1	When C-2299/VRC RETRANS switch is set to OFF and RAD TRANS switch is set to 1 or 2 position, the receiver-transmitter does not respond to control from the audio accessory connected to the C-2299/VRC.	a. Defective receiver-transmitter.	a. Connect the audio accessory to the receiver-transmitter and make a communication check with the distant radio. If unsuccessful, use the procedures in *b* above to troubleshoot the receiver-transmitter.
		b. Defective cables	b. Replace the CX-4723/VRC between each receiver-transmitter and the C-2299/VRC. Recheck communication with the audio accessory connected to the C-2299/VRC.
		c. Defective C-2299/VRC	c. Replace C-2299/VRC. Higher maintenance level repair is required.
2	Receiver-transmitters do not perform retransmission function when C-2299/VRC RETRANS switch is set to ON.	a. Defective receiver-transmitter.	a. Perform the following: (1) Connect the audio accessory to each receiver-transmitter, in turn, and make a communication check with the distant radio terminals using *squelch mode* operation. (2) If unsuccessful, use procedures in *b* above to troubleshoot the radio.
		b. Defective cables	b. Replace the CX-4723/VRC, in turn, between each receiver-transmitter and the C-2299/VRC.
		c. Defective C-2299/VRC	c. Replace C-2299/VRC. Higher maintenance level repair required.

5-10. Troubleshooting Equipment of Radio-Intercom System

a. General. The following procedures for locating faulty equipment in the radio-intercom system apply whether the trouble is in radio communication or in intercom communication. The troubleshooting procedures include checking the AM-1780/VRC and the control boxes connected to it. Also included are procedures for troubleshooting the C-2299/VRC connected to the AM-1780/VRC. Before proceeding, perform the operations in the operator's troubleshooting procedures (para 4-6).

(1) Refer to the typical cabling diagram applicable to the radio installation used the radio-intercom system in trouble (fig. 2-28 through 2-35).

(2) A test cable, CX-4723/VRC, approximately 20 feet long is required as a temporary substitute for installed cables. If equipment works after substitution, install a new cable in place of the original cable.

(3) A test cable, approximately 20 feet long, is required as a temporary substitute for the cables and vehicle wiring between C-2297/VRC and the C-2296/VRC. Fabricate it from two CX-7058/VRC's by cutting off a nine-pin connector from both cables and splicing the cable wire together.

b. Troubleshooting Radio-Intercom System. After performing each corrective measure, check the operation of the equipment to determine whether normal indications are restored. Refer to figures FO-3 through FO-6 for power and signal distribution circuits of radio-intercom system.

Item No.	Symptom	Probable troubles	Corrective measures
1	Unable to communicate on intercom from all control boxes; radio is operative and POWER indicator lamp on AM-1780/VRC is lighted.	*a.* Defective cables	*a.* Perform the following: (1) Substitute test cable CX-4723/VRC (*a*(2) above) between J501 on AM-1780/VRC and the MT-1029/VRC. If communication is restored, replace the original cable. (2) While attempting to establish communication from the control boxes, remove, in turn, the cable from the AM-1780/VRC to each control box. When communication is restored, replace the cable the removal of which restored communication.
		b. Defective control box	*b.* If communication ceases when the cable removed in operations in *a*(2) above is reconnected to a control box, replace that control box. Higher maintenance level repair is required.
		c. Defective AM-1780/VRC.	*c.* Replace AM-1780/VRC. Higher maintenance level repair is required.
2	Unable to communicate on intercom or radio from one C-2298/VRC.	Defective cable, C-2298/VRC, or AM-1780/VRC.	Perform the following: *a.* Substitute test cable CX-4723/VRC (*a*(2) above) between C-2298/VRC and AM-1780/VRC. If communication is restored, replace original cable; if not, replace C-2298/VRC. *b.* If neither of above reestablish communication, replace AM-1780/VRC.
3	Unable to transmit on intercom and radio from one control box; signals from radio and intercom can be heard.	Defective control box	Replace control box. Higher maintenance level repair is required.
4	Unable to communicate on intercom from all control boxes. Radio operation is satisfactory.	Defective AM-1780/VRC	Replace AM-1780/VRC. Higher maintenance level repair is required.
5	Unable to communicate on radio from all control boxes. Intercom operation is satisfactory. Radio operation is satisfactory	Defective AM-1780/VRC	Replace AM-1780/VRC. Higher maintenance level repair is required.

Item No.	Symptom	Probable troubles	Corrective measures
	when audio accessory is connected directly to radio.		
6	Unable to communicate on intercom and radio from C-2297/VRC.	*a.* Defective cables or C-2297/VRC.	*a.* Substitute test cable CX-4723/VRC (*a*(2) above) between C-2297/VRC and AM-1780/VRC. If communication is restored, replace, in turn, the CX-7060/VRC connected to the AM-1780/VRC and the one connected to the C-2297/VRC. If communication is still not restored, inspect and repair the vehicle slip rings between the outlet at the driver's position and the outlet at the AM-1780/VRC. If communication is not restored when the test cable is connected to the C-2297/VRC, replace the C-2297/VRC. Higher maintenance level repair is required.
		b. Defective AM-1780/VRC.	*b.* Replace AM-1780/VRC. Higher maintenance level repair is required.
7	Unable to communicate on intercom and radio from C-2296/VRC.	*a.* Defective cables	*a.* Substitute the test cable CX-7058/VRC(*a*(3) above) between the C-2297/VRC and the C-2296/VRC. If communication is restored, replace, in turn, CX-7057/VRC (or CX-7055/VRC) and CX-7056/VRC. If communication is still not restored, inspect and repair the vehicle cabling between the C-2297/VRC and the C-2296/VRC.
		b. Defective C-2296/VRC	*b.* If communication is still not restored when the test cable is connected to the C-2296/VRC, replace the C-2296/VRC. Higher maintenance level repair is required.
8	Retransmission: communication between individual receiver-transmitters and distant radios can be accomplished but retransmission operation through the relay site radios and the C-2299/VRC cannot be accomplished.	*a.* Defective cables	*a.* Substitute the test cable CX-4723/VRC (*a*(2) above) between the AM-1780/VRC and one side of the C-2299/VRC and then the other side of the C-2298/VRC. If communication is restored, replace the defective original cable.
		b. Defective C-2299/VRC	*b.* Replace the C-2299/VRC. If communication is restored, C-2299/VRC is defective; higher maintenance level repair is required.
		c. Defective cables between AM-1780/VRC and radios.	*c.* Substitute the test cable CX-4723/VRC between one radio mount and the AM-1780/VRC, then between the other radio mount and the AM-1780/VRC. If communication is restored, replace the defective original cable.
		d. Defective AM-1780/VRC.	*d.* Replace the AM-1780/VRC. Higher maintenance level repair is required.

5-11. Troubleshooting Receiver-Transmitter and R-442(*)/VRC, Using Test Equipment

When troubleshooting procedures at the radio site by the operator (para 4-5) and the organizational repairman (para 5-9) do not clear the trouble, use the procedures in *c* below for the receiver-transmitter and in *d* below for the R-442(*)/VRC. After performing each corrective measure, check the radio performance to determine whether normal operation is restored (para 5-8).

a. Equipment Required. The following equipment are required to troubleshoot the radios.

Item	*Reference*	*Purpose*
24 to 28-volt dc power source; such as vehicle battery [a].		To provide operating power through the MT-1029/VRC for the AN/VRM-1(*) and the radio.
Test Set, Radio AN/VRM-1(*)[b]	TM 11-6625-496-12	To isolate defective circuits, modules, and relays.

Item	Reference	Purpose
Mounting MT-1029/VRC	Fig. 2-7	To provide a power connection between the dc power source and the AN/VRM-1(*) and the receiver-transmitter.
MT-1898/VRC	Fig. 2-8	To provide a power connection between the dc power source and the AN/VRM-1(*) and the R-442(*)/VRC.
Antenna AS-1729/VRC (or AT-912/VRC).	Fig. 1-11 (or fig. 1-12)	To provide a facility for transmission and reception with another receiver-transmitter. The antenna can be used for the receiver-transmitter and R-442(*)/VRC.
Cable Assembly, Radio Frequency CG-1773/U.	Fig. 2-17	To provide a connection between the radio and the AS-1729/VRC (or AT-912/VRC).
Cable Assembly, Special Purpose, Electrical CX-4722/VRC.	Fig. 2-17	To provide control of the matching unit of the AS-1729/VRC (or AT-912/VRC).
Handset H-189/GR, or equivalent	Fig. 3-11	To provide keying and listening facility.
Receiver-transmitter known to be good; located in the vicinity of the repair facility.		To provide for transmission and reception testing of the radio under repair.

[a] Power Supply PP-2953(*)/U (para 6-5; TM 11-6130-233-12), if available, may be used as the dc power source.
[b] AN/VRM-1(*) represents AN/VRM-1 and AN/VRM-1A.

b. Test Setup.

(1) Power to operate the radio may be obtained by installing the radio in its radio mount which, in turn, is connected to the vehicle electrical system or a dc power supply, such as PP-2953(*)/U. Power to operate the AN/VRM-1(*) to test the radio is obtained in the same way.

(2) To operate the radio while it is removed from its mount or when the top and bottom covers are removed for repair and troubleshooting, connect the AN/VRM-1(*) between the radio and its mount (TM 11-6625-496-12).

(3) To check RF power output of the receiver-transmitter, connect the TS-2609/U, if available, between the receiver-transmitter and the antenna (fig. 5-2).

(4) To check radio transmission and reception, connect an audio accessory to the radio audio receptacles (para 3-15).

(5) To check the performance of the radio before and after troubleshooting and repair, use applicable procedures in paragraph 5-8.

(6) To gain access to and replace parts indicated in these procedures, refer to the repair procedures in section III (below).

(7) Arrange with a nearby receiver-transmitter to provide communication checks with the radio under test.

c. Receiver-Transmitter Troubleshooting Procedures. The following operations are performed after the system troubleshooting procedures by the operator (para 4-5) and the organizational repairman (para 5-8, 5-9, or 5-10) have determined that the receiver-transmitter is defective. Check the performance of the receiver-transmitter in the sequence given in the following chart and perform the indicated corrective actions when normal indications are not obtained. When the corrective actions specified in the following chart, or in TM 11-6625-496-12 when the AN/VRM-1(*) is being used, do not clear the trouble, higher maintenance level repair is required.

Step	Action	Normal indication	Corrective measures
		Radio reception	
1	Turn POWER switch to LOW and LIGHT switch to ON.	Dial lamp lights. Proceed to step 3	Turn POWER switch to OFF BREAKER-RESET and back to LOW. If circuit breaker trips after resetting, higher maintenance level repair is required. Replace dial lamp.
2	Turn POWER switch to OFF. Remove radio from its mount and measure voltage from terminal B of radio receptacle on MT-1029/VRC.	Power supply or battery voltage: +22 to +30 volts dc.	Check power cable connections. Check power source. Check continuity of power cable; pins A (neg) and B (pos). Replace MT-1029/VRC. Check relay K404 by substitution.

Step	Action	Normal indication	Corrective measures
3	Replace radio in its mount if removed in preceeding step. Set radio switches as follows: POWER: LOW SQUELCH: NEW OFF VOLUME: midrange MC control: turn to a number of positions.	Rushing noise is heard	Remove the radio from its mount. Remove the top and bottom covers from the radio. Connect the AN/VRM-1(*) to the radio and the radio mount. Perform the generalized test procedures specified in TM 11-6625-496-12 for sectionalizing troubles. *a.* If trouble is indicated in assembly A3000, perform operations in step 4*a*. *b.* If troubles are indicated in assembly A4000, perform operations in step 4*b*. *c.* If trouble is indicated in assembly A5000, perform operations in step 4*c*.
4	Setup a nearby radio to transmit on frequency in trouble and obtain a long test signal.	Test signal is received loud and clear	Connect the AN/VRM-1(*) to the radio and check, in turn, the following: *a.* Assembly A3000. In addition to the replacement of modules and relay, replace cable assemblies W403, W202/W402, and W404. If the signal is motorboating, replace A3700. *b.* Assembly A4000. In addition to the replacement of modules, replace A5100. If the audio signal is distorted, replace FL4002 and FL4001, in turn. *c.* Assembly A5000.
5	Turn SQUELCH switch to NEW ON, then to OLD ON.	In both positions, no sound is heard (radio is squelched).	Replace A5200 and A5300. Replace K5002.
6	Turn SQUELCH switch to NEW ON. Obtain a long test signal from distant transmitter (transmitting with 150-Hz squelch tone).	CALL indicator lamp lights and test signal is heard loud and clear.	Replace A5200 and A5300. Replace K5002.
7	If available, connect the TS-2609/U between the radio and the antenna. Set the SQUELCH switch to NEW OFF. Key the radio and transmit a long test signal.	*Radio transmission* The blower motor should be heard running. Sidetone should be heard. The signal should be received at the distant receiver loud and clear. And the wattmeter should indicate between 0.5 and 8 watts.	If the sidetone is heard and wattmeter indication is obtained, but the signal is not received at the distant receiver, driver, power amplifier, or antenna relay is defective; higher maintenance level repair of the radio is required. If the sidetone is not heard, but the signal is received by the distant receiver, replace W303, and K5001. If the distant receiver must tune to frequencies on either side of the transmitted frequency in order to obtain reception, check A3000 and A8000 with the AN/VRM-1(*). If the required wattmeter indication is not obtained, or the signal is not received by the distant receiver, use the AN/VRM-1(*) to check A8000. If the blower motor does not run, or there is no indication on the wattmeter, proceed as follows: *a.* Measure the voltage at the test points on A9000 (*d* below).

Step	Action	Normal indication	Corrective measures
			b. If no voltage or below normal voltage indications are obtained at test points TP9001 or TP9002, A9000 is defective. Higher maintenance level repair of the radio is required. *c.* If normal voltage indications are obtained, replace, in turn, relays K401; K403, K402, and K406. Replace W407.
8	Set the POWER switch to HIGH and key the radio.	The wattmeter should indicate no less than 35 watts.	If the indication is below 35 watts, replace relay K406. Higher level maintenance of the radio is required.
9	Set the SQUELCH switch to NEW ON; key the radio, and transmit a long test signal to the distant receiver (which is set to receive the 150-Hz squelch signal).	The CALL indicator lamp lights and sidetone is heard. The distant receiver is unsquelched and the test signal is heard loud and clear.	Replace, in turn A5200 and A8500.
		RT-246(*)/VRC pushbutton circuits	
10	Turn the BAND switch to AUTO. Starting with channel 1 pushbutton, push each pushbutton and wait for the selected frequency to appear in the dial window.	After each pushbutton is operated, the selected frequency appears in the dial window within 5 seconds.	If a wrong channel or a red indicator appears, readjust the particular pushbutton tuning controls using the instructions provided on the instruction plate on the pushbutton cover (fig. 3-2). If the wrong frequency consistently appears in the dial window, replace A7000. Higher maintenance level repair of the radio is required.

d. A9000 Assembly Voltage Chart. To measure the output of the power supply A9000 and A9400 at the test points on A9000 (fig. 5-4 or 5-8), key the radio and connect the AN/URM-105 to the indicated test points. The required voltages are given in the following chart. Test point TP9005 indicates the voltage of the vehicle battery or power supply.

Test point	Input voltage measured at test point TP9005		
	+22 volts dc	+25 volts dc	+30 volts dc
TP9001	+600 volts dc, min	+690 to +720 volts dc	+850 volts dc, max
TP9002	+240 volts dc, min	+270 to +310 volts dc	+340 volts dc, max
TP9003	90 volts ac, min	108 to 116 volts ac	137 volts ac, max
TP9004[a]	-17.9 to -19.5 volts dc	-20.0 to -24.7 volts dc	-25.2 to -26 volts dc
TP9006	-1.0 to -1.5 volts dc	-1.0 to -1.5 volts dc	-1.0 to -1.5 volts dc
TP9007	-1.8 volts dc, max	-1.8 volts dc, max	-1.8 volts dc, max

[a] In some radios, voltage indications are: -12.9 to -12.5 vdc at +22 vdc; -13.3 to -14.7 vdc at +25 vdc; and -16.2 to -17 vdc at +30 vdc.

e. R-442(*)/VRC Troubleshooting Procedures. The following operations are performed after the system troubleshooting procedures by the operator (para 4-5) and the organizational repairman (para 5-8, 5-9, or 5-10) have determined that the R-442(*)/VRC is defective. Check the performance of the R-442(*)/VRC in the sequence given in the following chart and perform the indicated corrective actions when normal indications are not obtained. When the corrective actions specified in the following chart, or in TM 11-6625-496-12 when the AN/VRM-1(*) is being used, do not clear the trouble, higher maintenance level repair is required.

Step	Action	Normal indication	Corrective measures
1	Turn POWER switch to ON-RESET and LIGHT switch to ON.	Dial lamp lights. Proceed to step 3	Turn POWER switch to OFF and back to ON-RESET. If the circuit breaker trips after resetting, higher maintenance level repair is required.
2	Turn POWER switch to OFF. Remove radio from its mount and measure voltage from terminal B of radio receptacle on MT-1898/VRC. If radio is part of radio-intercom system, the AM-1780/VRC and the associated receiver-transmitter must be turned on.	Power supply or battery voltage: +22 to +30 volts dc.	Check power cable connections. Check power source. Check continuity of power cable CX-4721/VRC; pins A (neg) and B (pos). Replace MT-1898/VRC.
3	Replace radio in its mount if removed in preceeding step. Set radio switches as follows: POWER: ON-RESET SQUELCH: NEW ON VOLUME: midrange MC control: turn to a number of positions.	Rushing noise is heard	Remove the radio from its mount. Remove the top and bottom covers. Connect the AN/VRM-1(*) to the radio and the mount. Perform the generalized test procedures specified in TM 11-6625-496-12 for sectionalizing troubles. *a.* If trouble is indicated in assembly A3000, perform operations in step 4*a*. *b.* If trouble is indicated in assembly A4000, perform operations in step 4*b*. *c.* If trouble is indicated in assembly A5000, perform operations in step 4*c*.
4	Setup a nearby radio to transmit on the frequency in trouble and obtain a long test signal.	Test signal is received loud and clear	Connect the AN/VRM-1(*) to the radio and check, in turn, the following: *a.* Assembly A3000. In addtion to the replacement of modules and relay, replace cable assemblies W203, W202/W402, and W204. If the signal is motorboating, replace A3700. *b.* Assembly A4000. In addition to replacement of modules, replace A5100. If the audio signal is distorted, replace FL4002 and FL-4001, in turn. *c.* Assembly A5000.
5	Turn SQUELCH switch to NEW ON, then to OLD ON.	In both positions, no sound is heard (radio is squelched).	Replace A5200 and A5300. Replace K5002.
6	Turn SQUELCH switch to NEW ON. Obtain a long test signal from distant transmitter (transmitting with 150-Hz squelch tone).	CALL indicator lamp lights and test signal is heard loud and clear.	Replace A5200 and A5300. Replace K5002.

Section III. REPAIR PROCEDURES

5-12. General

Repair of the radios at organizational level includes replacing modules, relays, module-interconnecting cable assemblies, front-panel knobs, dial lamps, and receptacle covers (app C). Removal and replacement procedures are provided in paragraphs 5-13 through 5-15. Observe the following general instructions.

a. After replacement of a module, do not attempt to adjust or align it.

b. When replacing modules in assembly A-3000, A4000, A5000, or A8000 during trouble-

shooting, leave the new module in the assembly and continue to test succeeding modules in the assembly.

(1) When the radio does not function after module replacement, remove each new module and put back the original module before submitting the radio to higher maintenance level for repair.

(2) When the radio functions after module replacement, remove each new module and replace the original until the defective module causes the radio to malfunction.

c. Dispose of defective modules in accordance with current directives.

d. When inserting modules and relays into their receptacles, be careful to mate the connector pins with the receptacle holes before pressing the part into place. After the part has been pressed into place, tighten the module holddown screw to a snug tightness; do not overtighten. Check the tighness of the module cover screws for snug tightness; do not overtighten.

e. After a module has been identified as good or bad, do not scratch the words on the cover. Use a grease pencil or felt tip pen to identify the modules. Scratched covers must be discarded if modules are repaired at higher maintenance facilities.

f. Before replacing covers on radios and control boxes, apply a light coating of insulating silicon compound to the preformed packing embedded in the covers (para–3*c*).

g. To work on the radios for troubleshooting and repair, observe the following handling requirements:

(1) NEVER CARRY RECEIVER-TRANSMITTERS USING ONE OF THE GUARDS OR HANDLE ASSEMBLIES; USE *BOTH* GUARDS OR HANDLE ASSEMBLIES.

(2) Usually it is most convenient to work on the radio while it is standing on the front panel guards or handle assemblies.

(3) Use a working surface that is flat, clean, and as smooth as possible. It should be free of nail and screw heads which may damage the internal parts when the radio is laid down on the side that is without the cover; or the impeller on the blower motor may be damaged.

(4) Do not slide the radio on the side from which the cover is removed.

(5) When a cover is not removed, make sure all its screws are screwed in fully. Thus, when the radio is shoved along a working surface, the cover screws and the working surface will not be damaged by the protruding screws.

(6) On plain model receiver-transmitters (A, figs. 1–8 and 1–9), the captive screws for the handle assemblies may be replaced with plain flathead screws instead of the captive screws (secs. II and IV, app C).

(7) Before turning the radio over to work on the other side, lower and screw down the chassis assemblies: A8000 and A3000 on the top, and A4000 on the bottom.

h. If the front panel guard of the plain model receiver-transmitters (figs. 1–8 and 1–9) is broken or the front panel is damaged by a broken guard, direct support maintenance can remove the front panel, remove the broken guard, and fill the holes with epoxy (FSN 8040–847–6387). The guards are not a maintenance item and are not required to be replaced on plain model receiver-transmitters when the holes are filled with epoxy. Thus, the handle assemblies (para 1–12*b*) are installed on plain model receiver-transmitters that have both guards, one guard, or no guards. The handle assemblies are not authorized for –A model receiver-transmitters.

5–13. Receiver-Transmitters, Parts Removal and Replacement

Figures 5–3 through 5–6 show the location of parts on the RT–246(*)/VRC; figures 5–7 through 5–10 show the location of parts on the RT–524(*)/VRC. Parts removal and replacement on assemblies A3000, A4000, A8000, A-5000, and A2100 (located below A5000) are provided in *a* through *e* below. Removal of assembly A9000 to gain access to relays K401, K402, K403, K404, and K406 and removal and replacement of FL401 are provided in *f* below. Removal and replacement of module-interconnecting cable assemblies are provided in *g* below.

a. Assembly A3000. Assembly A3000 is part of the receiver section of the receiver-transmitter (figs. 5–3 and 5–4, or 5–7 and 5–8). Refer to figure 5–11 for procedures to remove and replace modules on assembly A3000. The procedures also apply to assembly A3000 when it is part of the R–442(*)/VRC (fig. 5–17 and 5–18).

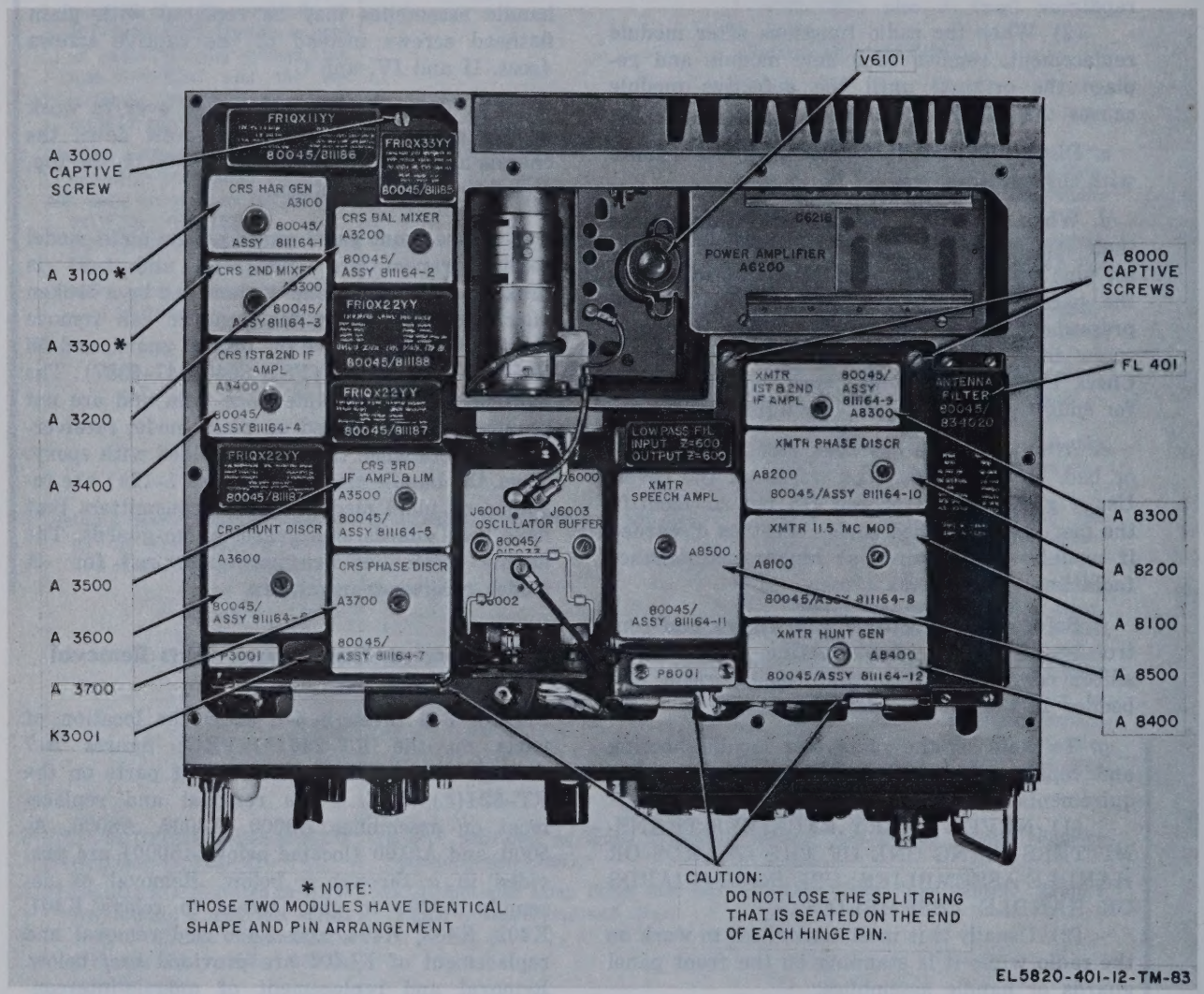


Figure 5-3. RT-246(*)/VRC, top view with assemblies in place.

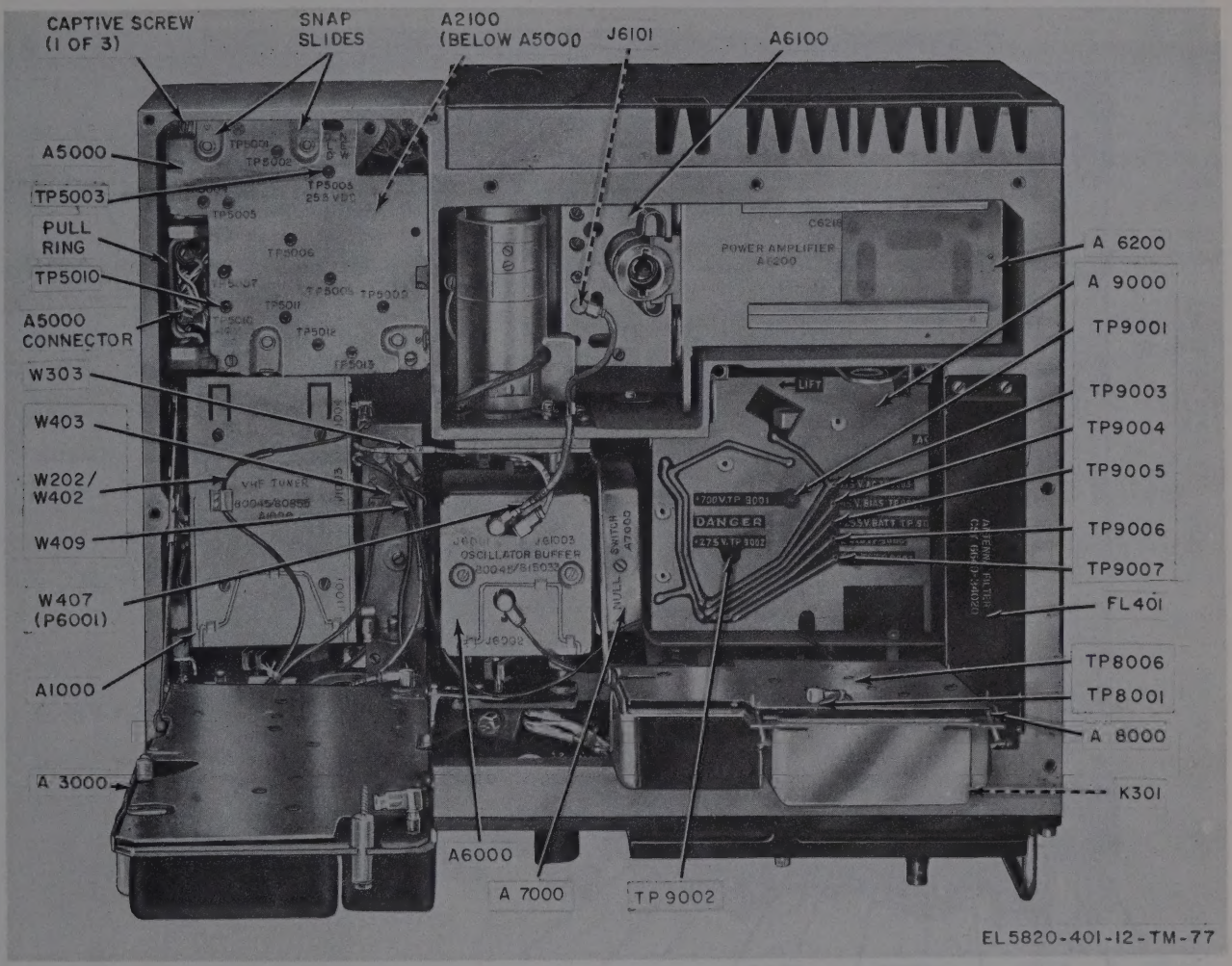


Figure 5-4. RT-246(*)/VRC, top view with assemblies A3000 and A8000 raised.

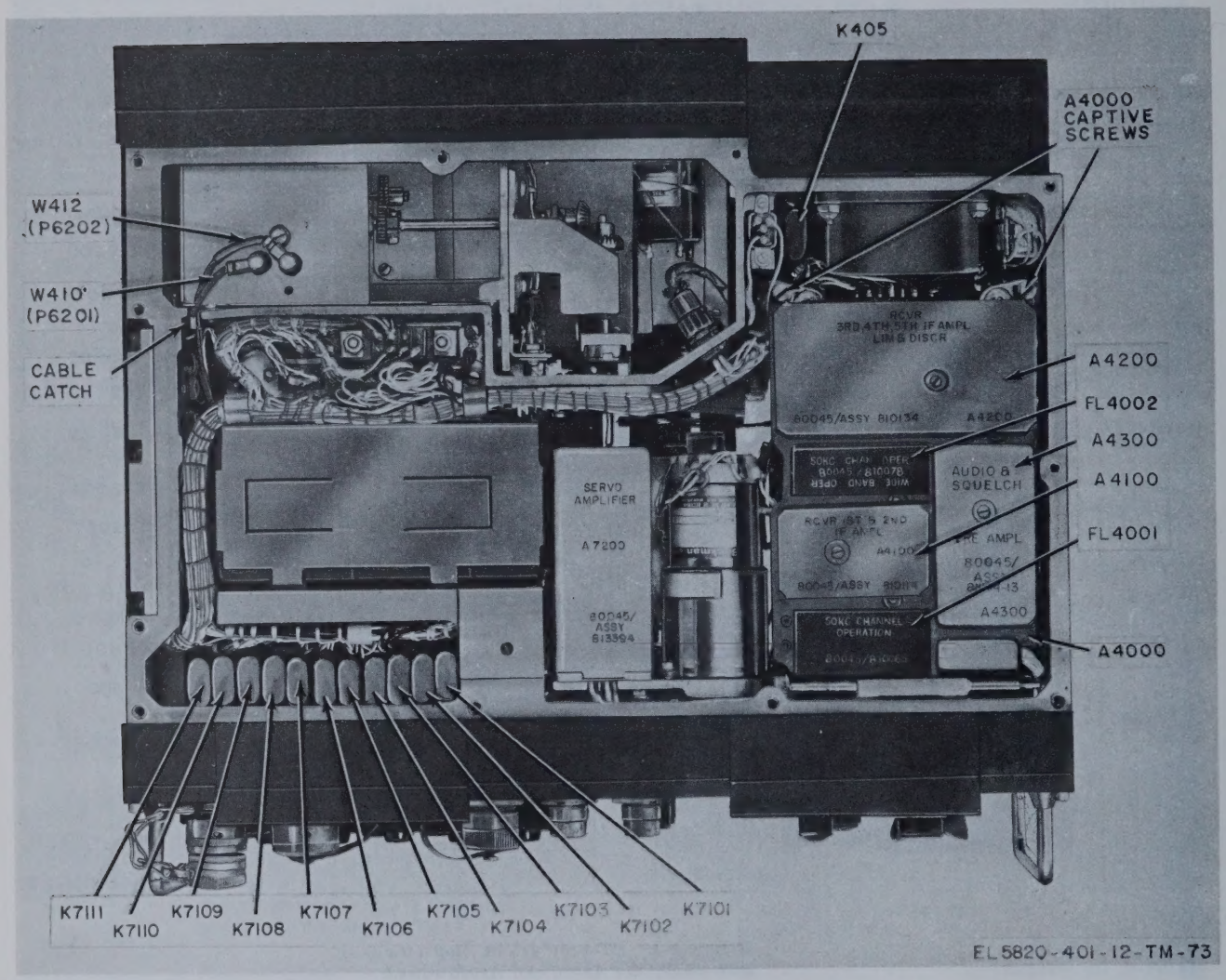


Figure 5-5. RT-245(*)/VRC, bottom view with assemblies in place.

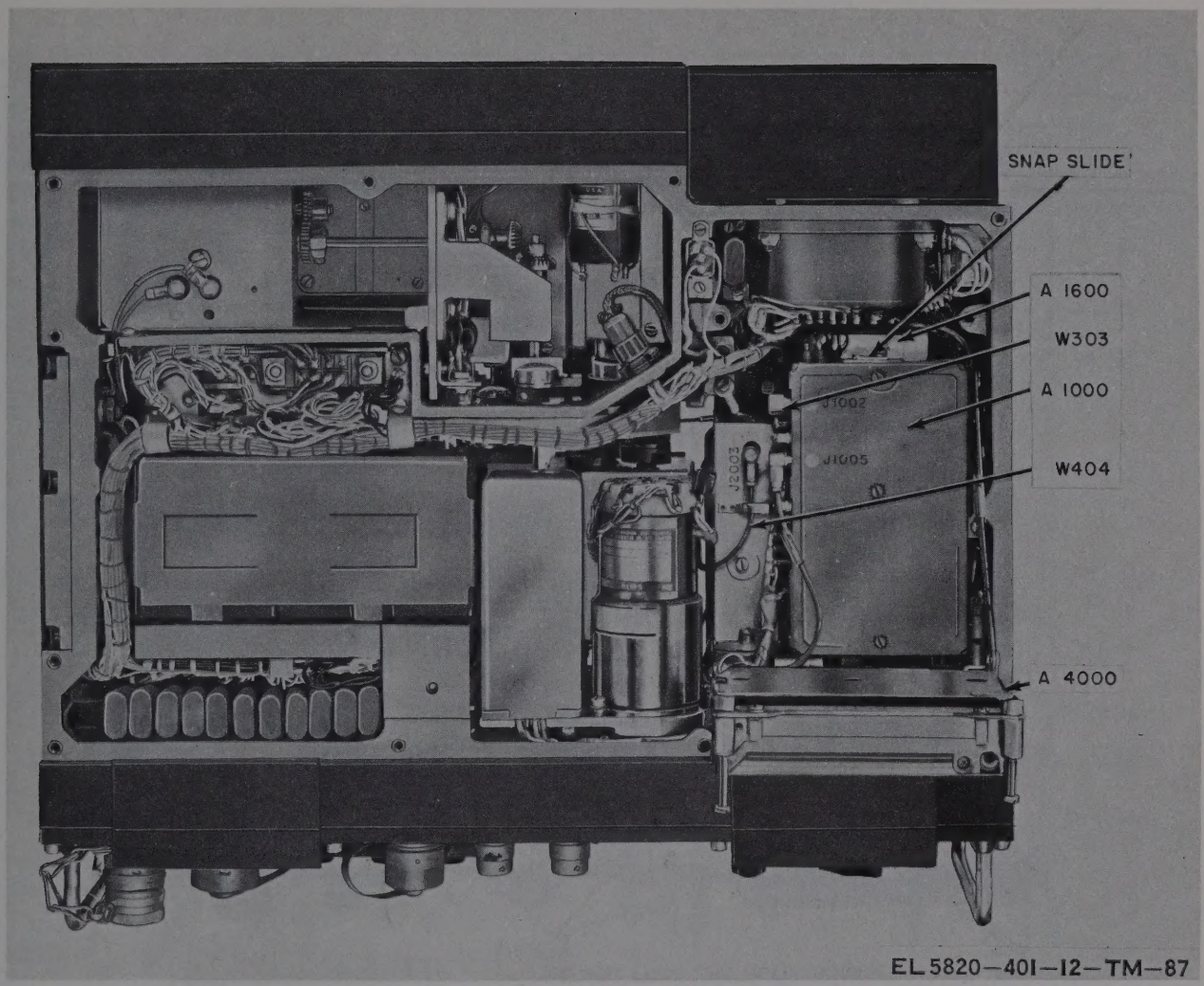


Figure 5-6. RT-246(*)/VRC, bottom view with assembled A4000 raised.

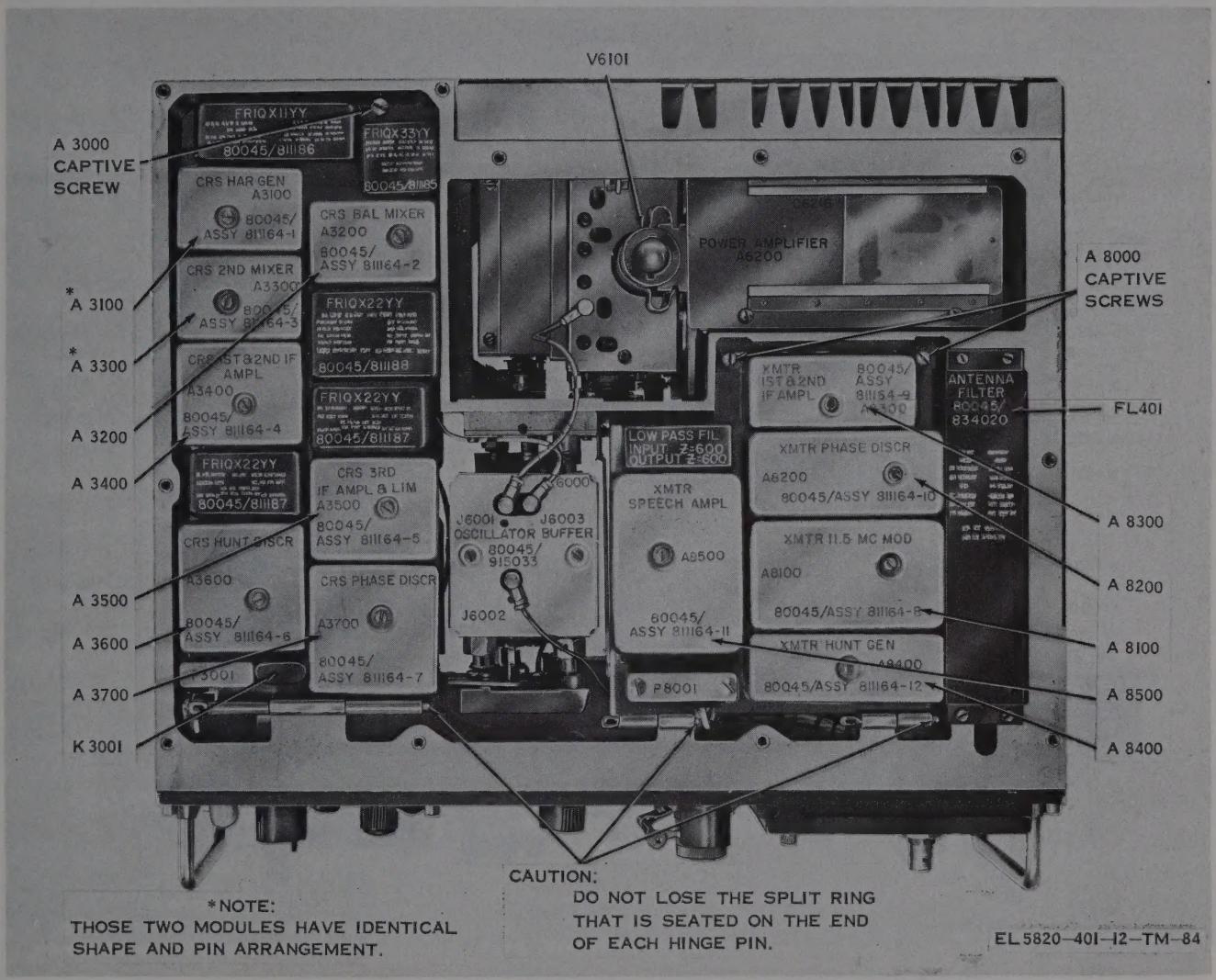


Figure 5-7. RT-524(*)/VRC, top view with assemblies in place.

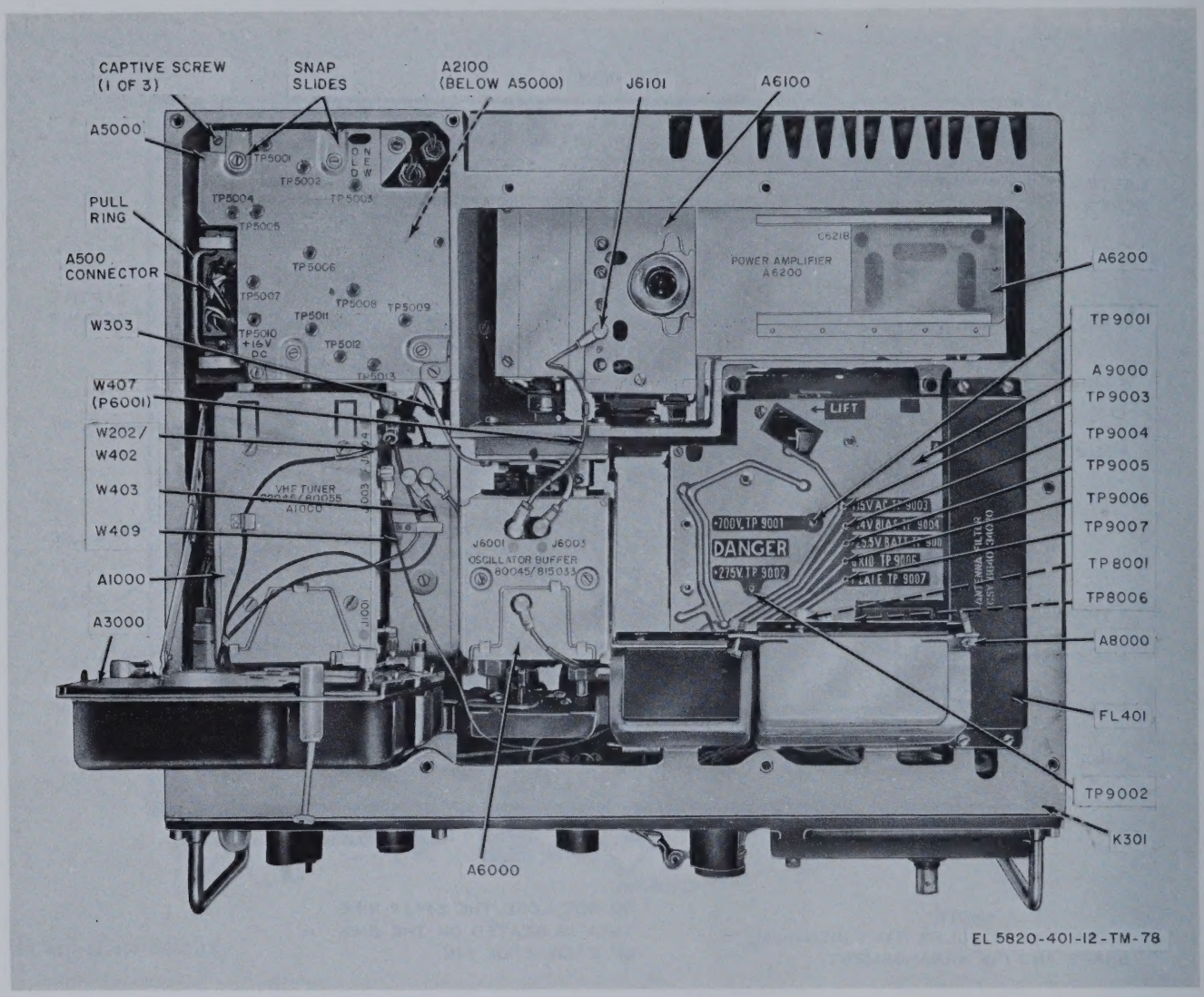


Figure 5-8. RT-524(*)/VRC, top view with assemblies A3000 and A8000 raised.

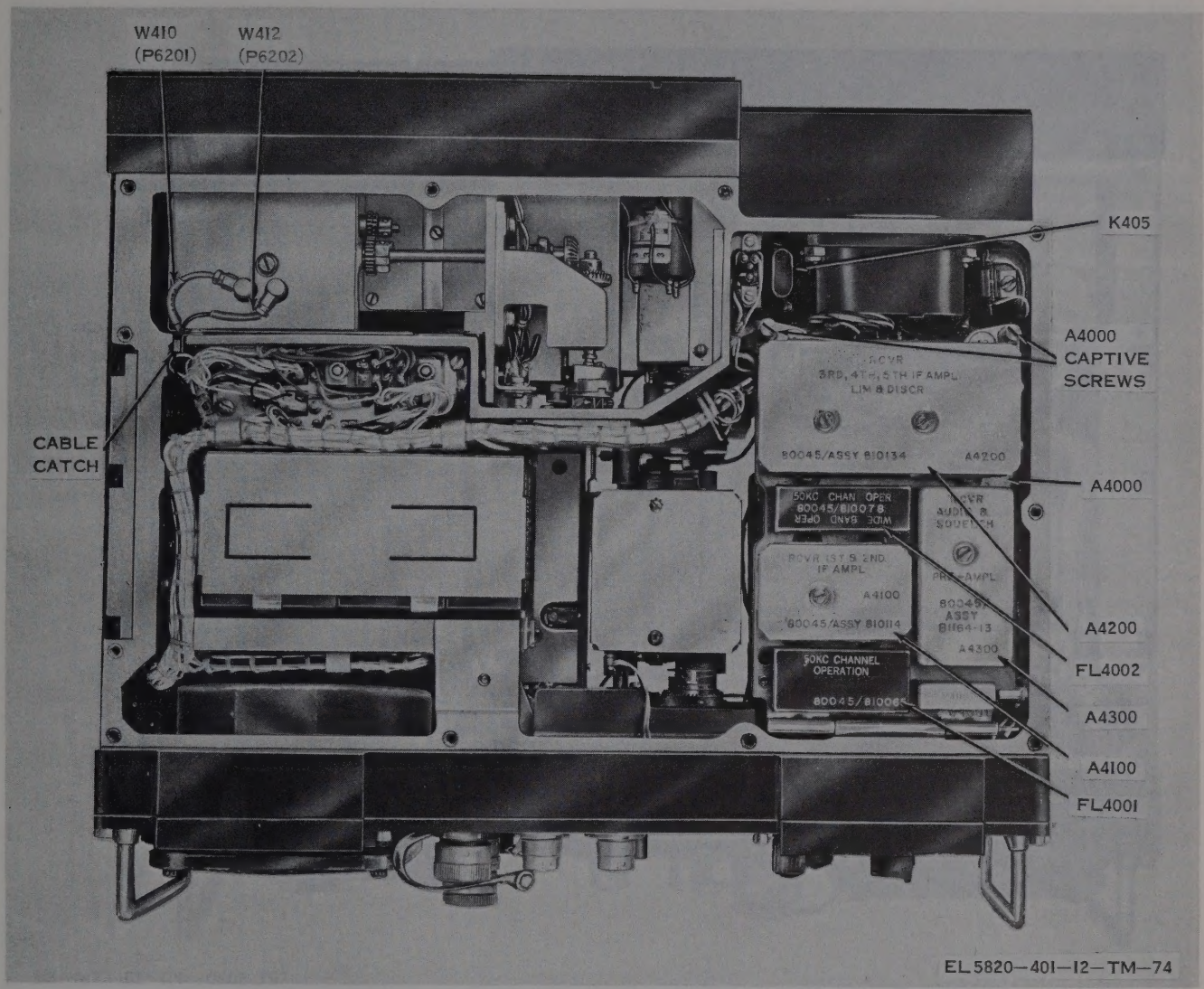


Figure 5-9. RT-524(*)/VRC, bottom view with assemblies in place.

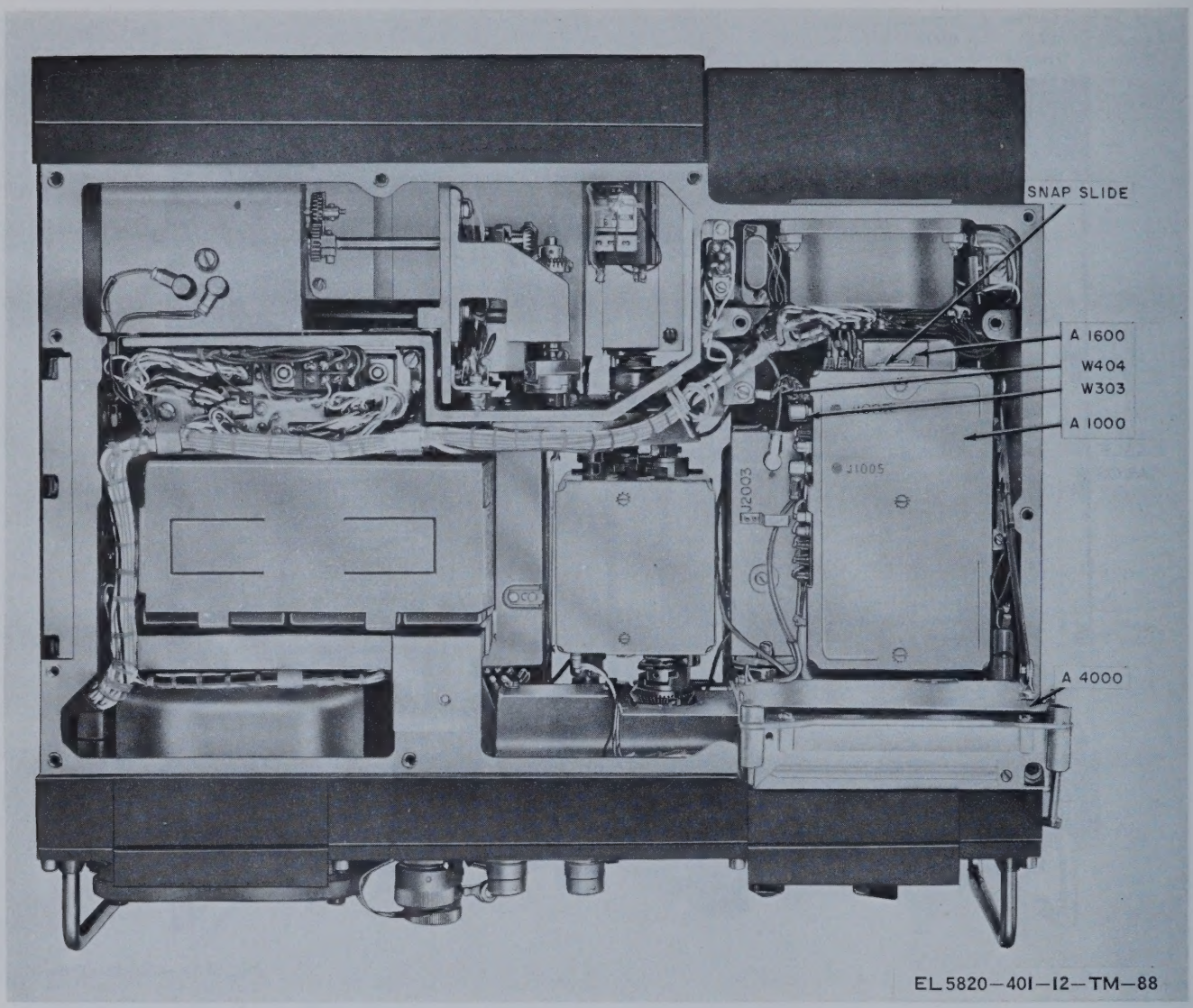


Figure 5-10. RT-524(*)/VRC, bottom view with assembly A4000 raised.

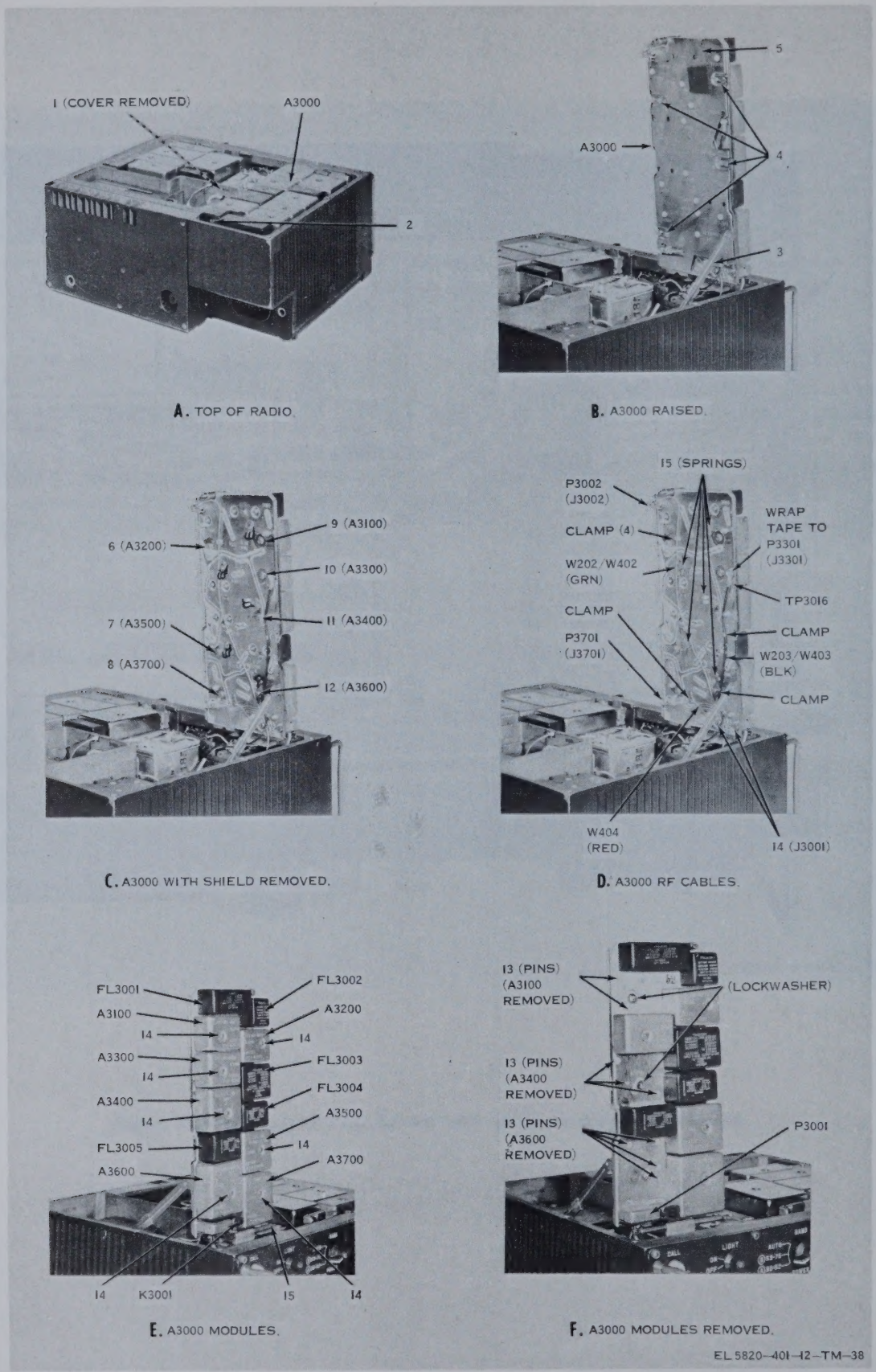


Figure 5-11. Assembly A3000, parts removal and replacement procedures.

STEPS TO FIGURE 5-11

STEP 1. Remove top cover (1) (not shown) from the radio.

STEP 2. Loosen A3000 captive screw (2).

STEP 3. Raise assembly and lock the brace (3).

STEP 4. Pull back snap slides (4) and remove shield (5).

STEP 5. Loosen captive screw (6 through 12) of module to be removed (view E). Carefully remove the module. Remove P3301 before removing A3300; remove P3701 before removing A3300; remove P3701 before removing A3700 (view D).

STEP 6. Before replacing module, inspect pins (13) to see that they are straight. Check to see that the captive screw lockwasher (view F) is in place.

STEP 7. Carefully push down the module after aligning the module receptacles with the pins (13) on the board. Tighten the module screw (6 through 12).

CAUTION

Be careful not to interchange modules A3100 and A3300; they have identical pin arrangements.

STEP 8. Check to see that the module cover screws (14) are not *loose*. If necessary, tighten for snug fit only.

STEP 9. Check to see that each cable assembly (P3002, P3301, and P3701 (view D) is pushed down on its receptacle. To prevent P3301 from touching test point TP3016, wrap one layer of plastic electrical tape around the connector.

STEP 10. Check to see that connector P3001 (view F) is pressed fully into its receptacle and that the screws holding the receptacle J3001 are not loose.

STEP 11. Replace the shield (5) and push in the snap slides (4).

STEP 12. Check to see that the hinge pin (15) is pushed in fully.

STEP 13. Lower assembly A3000 and tighten its captive screw (2).

STEP 14. Replace the top cover (1) (not shown) on the radio.

b. Assembly A4000. Assembly A4000 is part of the receiver section of the receiver-transmitter (fig. 5-5 and 5-6, or 5-9 and 5-10). Refer to figure 5-12 for procedures to remove and replace modules on assembly A4000. The procedures also apply to assembly A4000 when it is part of the R-442(*)/VRC (fig. 5-19 and 5-20).

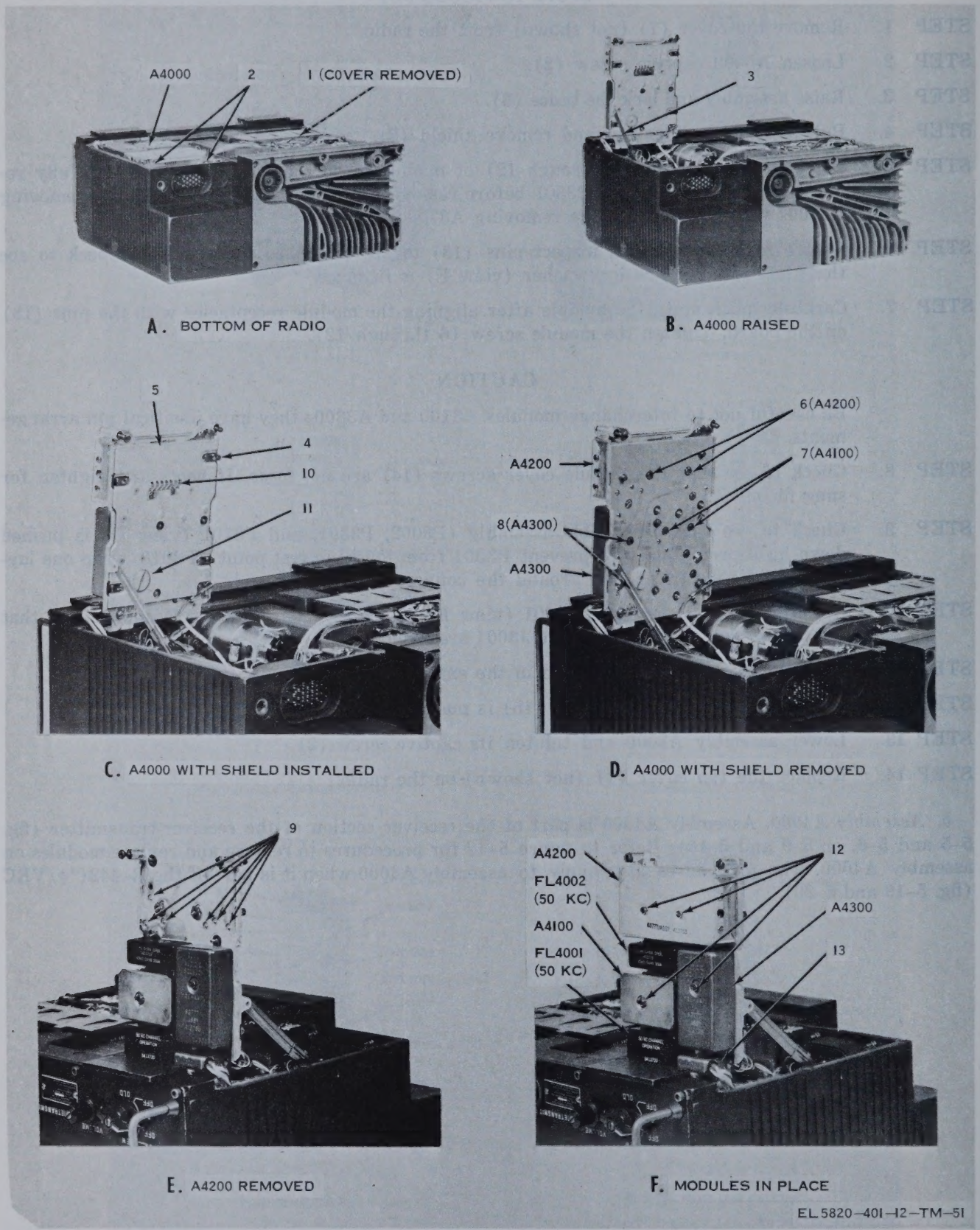


Figure 5-12. Assembly A4000, parts removal and replacement procedures.

STEPS TO FIGURE 5-12

STEP 1. Remove the bottom cover (1) (not shown) from the radio.

STEP 2. Loosen A4000 captive screws (2).

STEP 3. Raise assembly A4000 and lock the brace (3).

STEP 4. Pull back the snap slides (4) and remove the shield (5).

STEP 5. Loosen the captive screws (6, 7, or 8) of the module to be removed. Carefully remove the module.

STEP 6. Before replacing the module, inspect the pins (view F shows pins (9) for A4200) to see that they are straight. Check to see that each lockwasher of the module captive screws is in place.

STEP 7. Carefully push down the module after aligning the module receptacles with the pins on the board.

STEP 8. Tighten the module screws (6, 7, or 8).

STEP 9. Replace the shield (5) and push in the snap slides (4).

STEP 10. Check the following:

a. X-MODE-NORMAL switch is set to NORMAL. However, if the radio is operable and will be used for X-mode operation, set the switch to X-MODE.

b. The module cover screws (12) are not loose. If necessary, tighten for snug fit.

c. Connector (13) is pressed fully into its receptacle and the screws holding the receptacle are not loose.

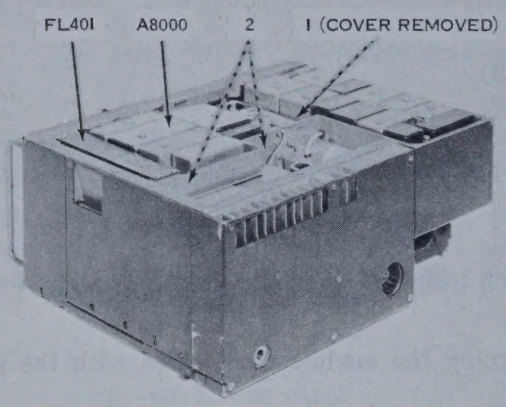
d. The leaf springs (10) are equally curved; adjust if necessary.

STEP 11. Lower assembly A4000 and tighten its captive screws (2).

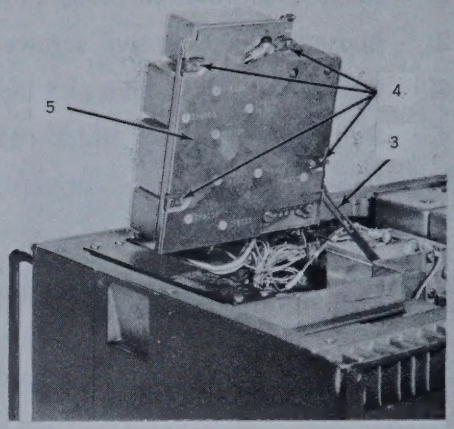
STEP 12. Check to see that the assembly hinge pin is pushed in fully.

STEP 13. Replace the bottom cover on the radio.

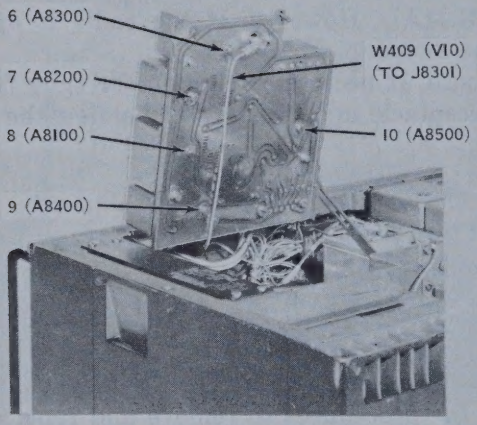
c. Assembly A8000. Assembly A8000 is part of the transmitter section of the receiver-transmitter (fig. 5-3 and 5-4, or 5-7 and 5-8). Refer to figure 5-13 for procedures to remove and replace modules on assembly A8000.



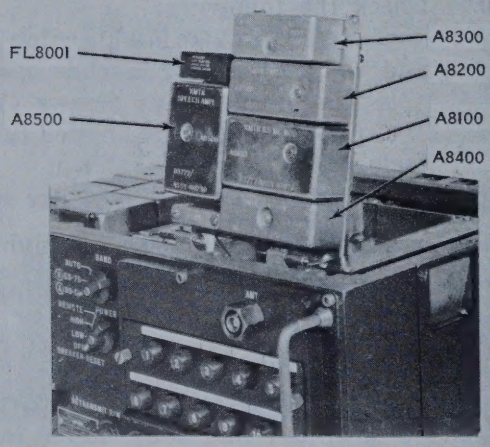
A. TOP OF RADIO.



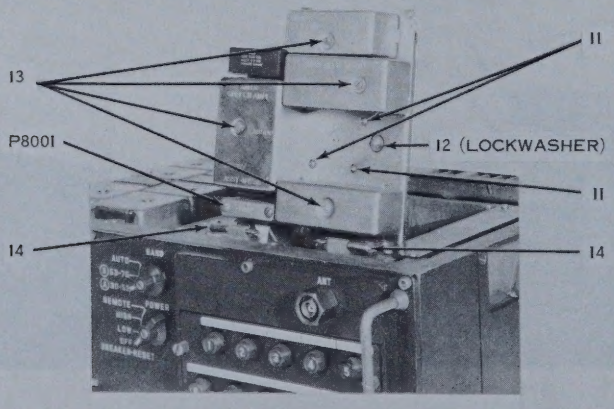
B. A8000 RAISED; WITH SHIELD (5).



C. A8000, WITH SHIELD REMOVED.



D. A8000 MODULES.



E. A8100 REMOVED.

EL5820-401-12-TM-37

Figure 5-13. Assembly A8000, parts removal and replacement procedures.

STEPS TO FIGURE 5-13

STEP 1. Remove the top cover (1) (not shown) from the radio.

STEP 2. Loosen A8000 captive screws (2).

STEP 3. Raise assembly A8000 and lock the brace (3).

STEP 4. Pull back the snap slides (4) and remove the shield (5).

STEP 5. Loosen the captive screw (6 through 10) of the module to be removed (view D). Carefully remove the module. Connector on W409(VIO) must be disconnected before removing A8300.

STEP 6. Before replacing module (A8100 is shown removed in view E), inspect the pins (11) on the board to see that they are straight. Check to see that the captive screw lockwasher (12) is in place.

STEP 7. Carefully push down the module after aligning the module receptacles with the pins (11) on the board. Tighten the module captive screw (6 through 10).

STEP 8. Replace the shield (5) and push in the slide fasteners (4).

STEP 9. Check the following:

a. The module cover screw (13) of each module is not *loose.* If necessary, tighten for snug fit.

b. The hinge pins (14) are inserted fully and the spring clip on each hinge is in place.

c. Connector of W409 (VIO) (view C) is connected to A8300 receptacle.

d. Connector P8001 (view E) is pressed fully into its receptacle. Check that connector P8001 screws are not loose.

STEP 10. Lower assembly A800 and tighten its captive screws (2).

STEP 11. Replace the top cover (1) (not shown) on the radio.

d. Assembly A5000. Assembly A5000 is part of the receiver of the receiver-transmitter; it is also part of the R-442(*)/VRC. Use the following procedures to remove and replace parts on assembly A5000. Refer to figures 5-14, and 5-3 and 5-4, or 5-7 and 5-8 while performing the following operations.

(1) Remove the top cover from the radio.

(2) Loosen assembly A3000 captive screw, raise the assembly, and lock the brace to hold it up.

(3) Loosen the three captive screws of A5000.

(4) Pry up the pull ring on A5000 until the A5000 connector comes loose from the receptacle in the radio. Carefully remove A5000 from the radio (fig. 5-14).

(5) Pull back the snap slides of the shield and remove the shield from A5000.

(6) To remove module A5100, A5200, or A5300 loosen the captive screw that holds the module to the board, and remove the module.

(7) Before replacing a module, inspect the pins in the board to see that they are straight.

(8) Carefully push down the module after aligning the module receptacles with the pins in the board. Tighten the module screw.

(9) To remove relays K5001 or K5002, remove the holddown clamp over the relays, pull out the relay, insert a new one, and replace the holddown clamp.

(10) Replace the shield on assembly A5000 and push in the snap slides.

(11) Check to see that the module covers are not loose. If necessary, tighten the cover screws for snug fit.

(12) To replace A5000 in the radio, position A5000 connector in line with the receptacle in the radio, lower the assembly until the connector can be felt falling into the radio receptacle. Then press the assembly down until it is fully seated.

(13) Tighten the three captive screws on assembly A5000.

(14) Lower assembly A3000 and tighten its captive screw.

(15) Replace the top cover on the radio.

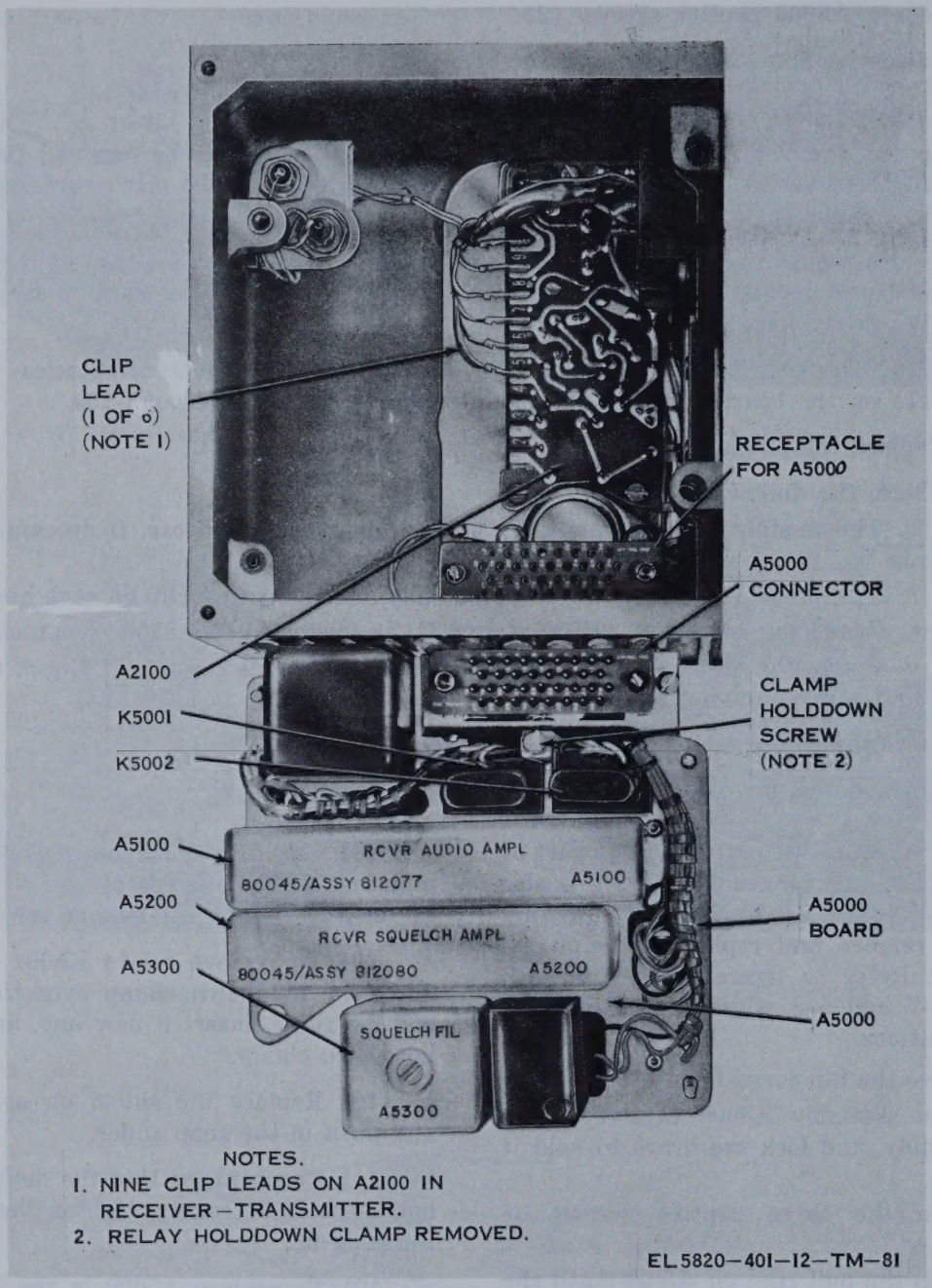


Figure 5-14. Assembly A5000 removed from the radio; and assembly A2100 in place in radio.

e. Assembly A2100. Assembly A2100 is part of the receiver of the receiver-transmitter; it is also part of the R–442(*)/VRC. Use the following procedures to remove and replace A2100. Refer to figures 5–14 and 5–4, 5–8, or 5–18 while performing the following operations. Assembly A5000 must be removed to gain access to A2100.

(1) Remove the top cover from the radio.

(2) Loosen assembly A3000 captive screw, raise the assembly, and lock the brace to hold it up.

(3) Loosen the three captive screws of A-5000.

(4) Pry up the pull ring on A5000 until the A5000 connector comes loose from the receptacle in the radio. Carefully remove A5000 from the radio (fig. 5–14).

(5) Note the clip lead color and pin receptacle to which is attached. Use a long nose pliers and carefully remove the clip leads from the receptacles.

(6) Remove the mounting screws and remove A2100 from the radio.

(7) Replace A2100 in position in the radio and tighten the mounting screws.

(8) Use a long nose pliers to insert each clip lead into its receptacle on A2100.

(9) Replace A5000 in the radio by positioning A5000 connector in line with the receptacle in the radio, lower the assembly until the connector can be felt falling into the radio receptacle. Then press the assembly down until it is fully seated.

(10) Tighten the three captive screws on assembly A5000.

(11) Lower assembly A3000 and tighten its captive screw.

(12) Replace the top cover on the radio.

f. Assembly A9000, Filter FL401 and Relays K401 through K406. Assembly A9000 (fig. 5–4 or 5–8) must be removed in order to gain access to the relays located below A9000. Refer to figure 5–15 for procedures to remove and replace assembly A9000 and filter FL401. Figure 5–16 shows the location of the relays when assembly A9000 is removed. Relay K405 is accessible after removing the bottom cover on the radio (fig. 5–5); the other relays are accessible after A9000 is removed (fig. 5–15).

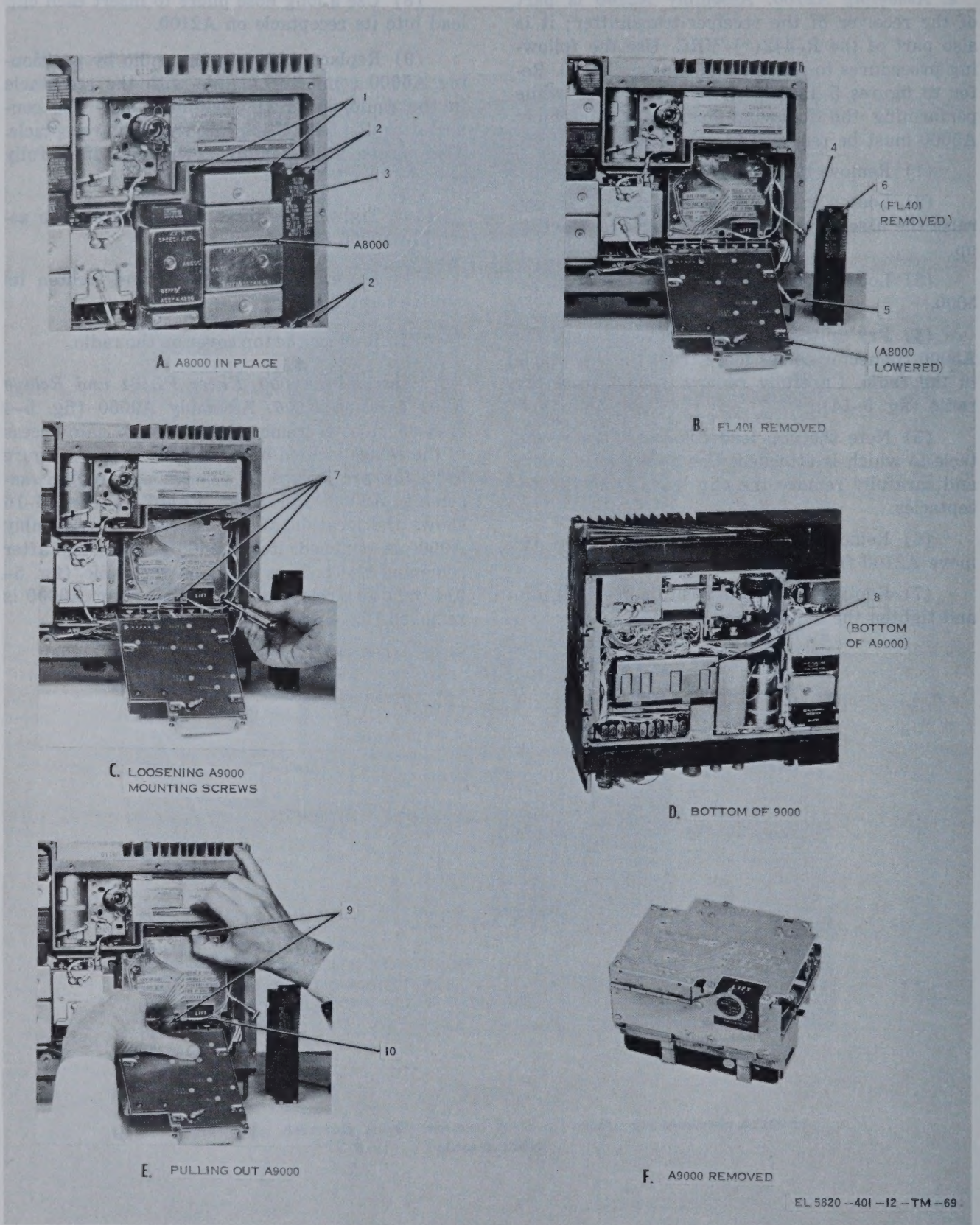


Figure 5-15. Assembly A9000, removal and replacement procedures.

STEPS TO FIGURE 5-15

STEP 1. Remove the top and bottom covers from the radio.

STEP 2. Loosen assembly A8000 captive screws (1), swing the assembly out, disconnect the brace and lower the assembly.

STEP 3. Loosen filter FL401 captive screws (2) and carefully pull the filter out of the radio. Be careful not to let the cable assembly connectors attached to the filter touch the radio case during the removal.

STEP 4. Remove connector (4) (FL401P2 of cable assembly W410 (orange)) and connector (5) (FL401P1 of cable assembly W411 (green)) from the filter. Set FL401 aside.

STEP 5. Loosen A9000 captive screws (7).

STEP 6. Push the bottom of A9000 (8) until A9000 is loosened from the receptacles in the radio. Raise the lift rings (9). Grasp one with each hand and carefully pull the assembly out of the radio.

STEP 7. To remove relays (fig. 5-16), loosen the relay captive screws and pull the relay out of its receptacle.

STEP 8. Before replacing a relay, check to see that its connector pins are straight. Insert the relay in its receptacle and tighten the captive screws.

STEP 9. Before replacing A9000, check the following: the pins on A9000 connectors are straight and the connectors float in their mounting screws; the screws around A9000 cases are tight.

STEP 10. Lay the radio down with the bottom of the radio on the bench. Check to see that the cavity for A9000 is free of wires that could be damaged during the insertion of the assembly.

STEP 11. Grasp each lift ring (9) (view E) and lower the assembly into the radio until the assembly connectors can be felt settling into the radio receptacles. Then carefully press the assembly down until it is fully seated.

STEP 12. Push the lift rings back into position and tighten the captive screws (7).

STEP 13. Connect orange connector FL401P2 (4) to J2 on FL401 and green connector FL401P1 (5) to J1 on FL401.

STEP 14. Without letting the cable connectors touch the radio case, insert FL401 into position and tighten FL401 captive screws (2).

STEP 15. Insert the brace into the pin on A8000, lower the assembly into position, and tighten A8000 captive screws (1).

STEP 16. Replace the top and bottom covers on the radio.

g. Module-Interconnecting Cable Assemblies.

(1) *Cable assemblies W410 (orange) and W411 (green).* W410 is connected between filter FL401 and assembly A6200; W411 is connected between FL401 and antenna relay K301.

(*a*) Remove the bottom and top covers of the radio.

(*b*) Remove filter FL401; refer to steps 1 through 4 in figure 5-15 for the procedures.

(*c*) To replace W410, disconnect it from FL401 and assembly A6200, and remove the cable assembly. On the replacement cable assembly, connect the end labeled P6201 to J6201 (fig. 5-5 or 5-9); connect the end labeled FL401P2 to FL401J2 (fig. 5-16). Insert the cable assembly into the notch in the partition and position the cable catch to keep W410 and W412 in place (fig. 5-5 or 5-9).

(*d*) To replace W411, disconnect it from FL401 and antenna relay K301 located below the end of FL401 on the front panel of the radio (fig. 5-4 or 5-8). On the replacement cable assembly, connect the end labeled FL401P1 to FL401J1 (fig. 5-16); connect the end labeled K301P3 to J3 on K301.

(*e*) Replace filter FL401 in the radio.

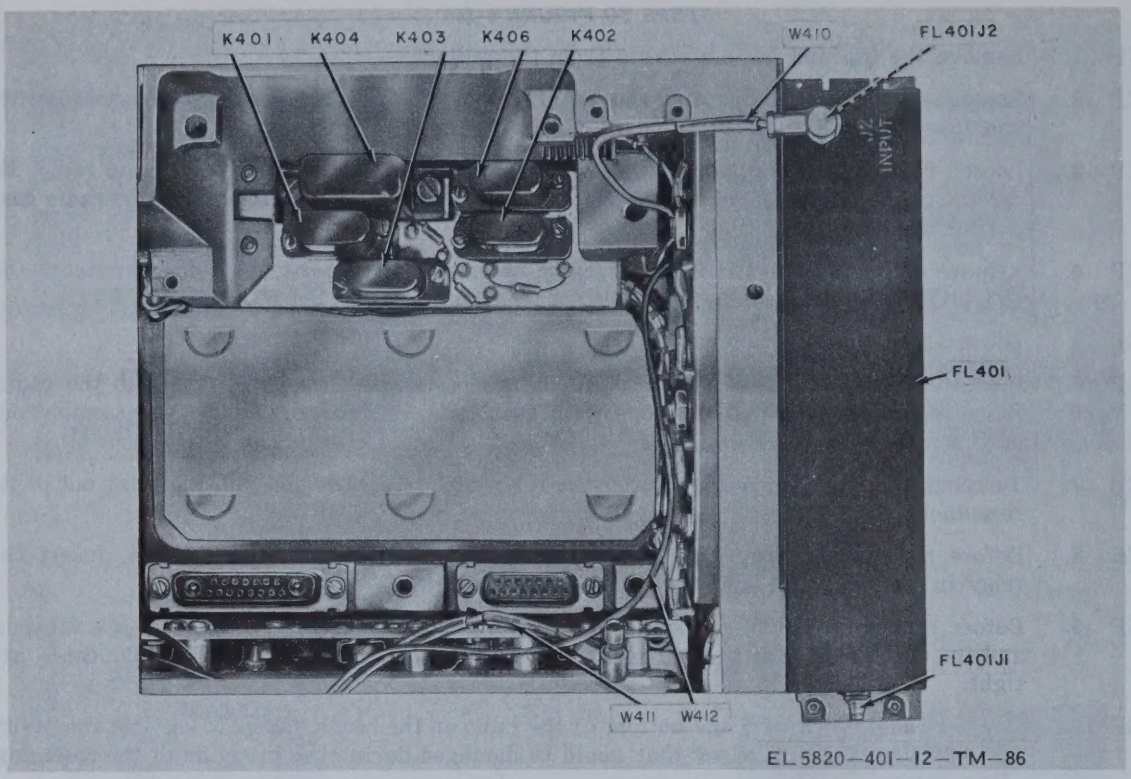


Figure 5-16. Location of relays K401, K402, K403, K404, and K406 after assembly A9000 is removed.

(*f*) Replace the top and bottom covers on the radio.

(2) *Cable assemblies W202/W402 (green), W403 (black), and W404 (red).* Cable assembly W202/W402 is connected between A3000 and A1000; W403 and W404 are connected between A3000 and A2000.

(*a*) To replace W202/W402 or W403 remove the top cover from the radio; to replace W404, remove the top and bottom covers from the radio.

(*b*) To replace W202/W402, proceed as follows:

1. Loosen A3000 captive screw (fig. 5-3 or 5-7), raise A3000, lock its brace, and remove the shield from A3000.

2. Disconnect W202/W402 from A1000 (fig. 5-4 or 5-8) and A3000 (D, fig. 5-11).

3. On the replacement cable assembly, connect the end labeled P1004 to J1004 on A1000 and the other end labeled J3002 to A3000.

4. Carefully slip the cable assembly under each of the cable clips on A3000 board and one on the cover of assembly A1000.

5. Replace the shield on A3000, lower the assembly, and tighten A3000 captive screw.

(*c*) To replace W403 or W404, proceed as follows:

1. Loosen A3000 captive screw (fig. 5-3 or 5-7), raise A3000, lock its brace, and remove the shield from A3000.

2. Disconnect W403 or W404 from A3000 receptacle (D, fig. 5-11); disconnect the other end from A2000 receptacle.

3. On the replacement cable W403, connect the end labeled P3301 to J3301 on A3000 (D, fig. 5-11) and the other end labeled P2002 to J2002 on A2000 (fig. 5-4 or 5-8). Carefully slip the cable assembly under the cable clips on A3000 and A2000.

4. On the replacement W404, connect the end labeled P3701 to J3701 on A3000 (D, fig. 5-11) and the end labeled P2003 to J2003 on A2000 (fig. 5-6 or 5-10). Carefully slip the cable assembly under the cable clips on A3000 and A2000.

5. Replace the shield on A3000, lower the assembly, and tighten A3000 captive screw.

(3) *Cable assembly W409 (red).* Cable assembly W409 is connected between assemblies A1000 and A8000.

(*a*) Remove the top cover from the radio.

(*b*) Loosen assembly A8000 captive screw, lower the assembly, lock the brace, and remove the shield from A8000. (A, B, and C, fig. 5–13).

(*c*) Disconnect W409 from A8000 (C, fig. 5–13) and A1000 (fig. 5–4 or 5–8).

(*d*) On the replacement cable, connect the end labeled P8301 to J8301 on A8000 and the end labeled P1003 to J1003 on A1000 (fig. 5–4 or 5–8).

(*e*) Carefully slip the cable assembly under the cable clip on A8000 and the one on A1000.

(*f*) Replace the shield on A8000, lower the assembly, and tighten A8000 captive screw.

(4) *Cable assemblies W407 (gray) and W303 (yellow).* Cable assembly W407 is connected between A6000 and A6200; W303 is connected between A6000 and A1000.

(*a*) To replace W407, remove the top cover from the radio; to replace W303, remove the top and bottom covers.

(*b*) To replace W407, disconnect it from A6000 and A6100 (fig. 5–4 or 5–8). On the replacement W407, connect the end labeled P6001 to J6001 and the end labeled P6101 to J6101. Slip the cable assembly into the notch in the partition in the radio.

(*c*) To replace W303, disconnect it from A6000 (fig. 5–4 or 5–8) and A1000 (fig. 5–6 or 5–10). On the replacement cable assembly, connect the end labeled P6003 to J6003 and the end labeled P1002 to J1002 on A1000.

(*d*) Replace the top or the top and bottom covers on the radio.

5–14. Parts Removal and Replacement in R–442(*)/VRC

Figures 5–17 through 5–19 show the location of parts on the R–442(*)/VRC. Parts removal and replacement on assemblies A3000, A4000, A5000, and A2100 are provided in *a* through *d* below, respectively. Removal and replacement of module-interconnecting cables assemblies are provided in *e* below.

a. Assembly A3000 (fig. 5–17 and 5–18). Assembly A3000 is also part of the receiver-transmitters (fig. 5–3 and 5–7). Therefore, refer to figure 5–11 to remove and replace parts on A3000 in R–442(*)/VRC, with two exceptions: module-interconnecting cable assemblies W403 and W404 are identified as W203 and 204, respectively, in the R–442(*)/VRC (fig. 5–18).

b. Assembly A4000 (fig. 5–19 and 5–20). Assembly A4000 is also part of the receiver-transmitters (fig. 5–5 and 5–9). Therefore, refer to figure 5–12 to remove and replace parts on A4000 in R–442(*)/VRC.

c. Assembly A5000 (fig. 5–14 and 5–18). Assembly A5000 is also part of the receiver-transmitters (fig. 5–4, 5–8, and 5–14). Therefore, refer to paragraph 5–13*d* to remove and replace parts on A5000 in R–442(*)/VRC.

d. Assembly A2100. Assembly A2100 is also part of the receiver-transmitters (fig. 5–4 and 5–8) and is located below assembly A5000 (fig. 5–18). Refer to paragraph 5–13*e* to remove and replace A2100 in R–442(*)/VRC.

e. Module-Interconnecting Cable Assemblies W202/W402 (Green), W203 (Black), and W204 (Red).

(1) Cable assembly W202/W402 (fig. 5–18)

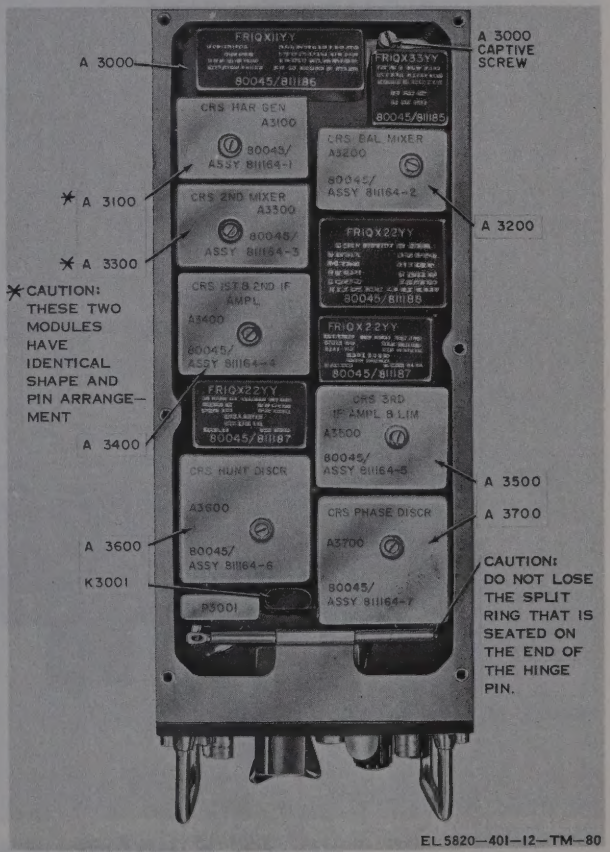


Figure 5–17. R–442(*)/VRC, top view with assembly A3000 in place.

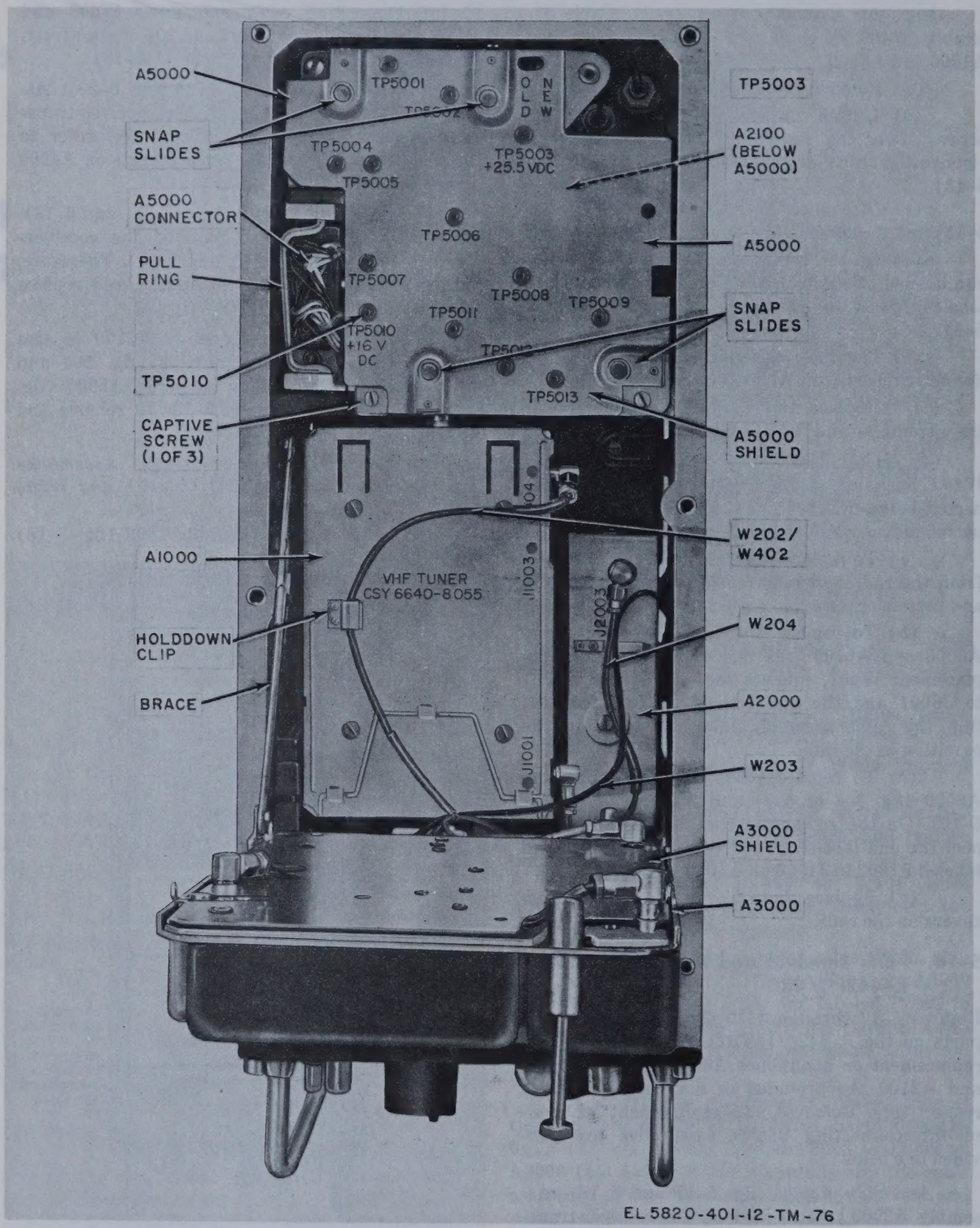


Figure 5-18. R-442(*)/VRC, top view with assembly A3000 raised.

is connected between A3000 and A1000; W203 (fig. 5–18 and 5–20) and W204 (fig. 5–18) are connected between A3000 and A2000. These cable assemblies are identical in function and location to ones in the receiver-transmitters; the removal and replacement procedures are also identical.

(2) To remove and replace the cable assemblies in the R–442(*)/VRC, refer to paragraph 5–13*g*(2) and use figures 5–17, 5–18, and 5–20 for parts location. W202/W402 has the same identification in both radios; W203 is identified as W403 in the receiver-transmitters; W204 is identified as W403 in the receiver-transmitters.

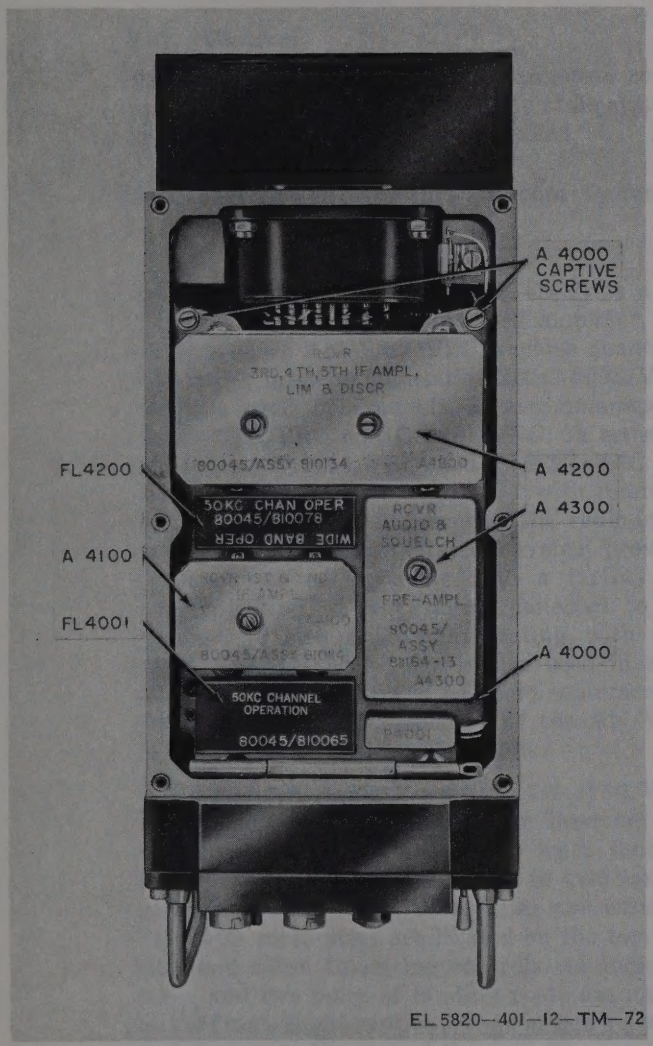


Figure 5–19. R–442(*)/VRC, bottom view with assembly A4000 in place.

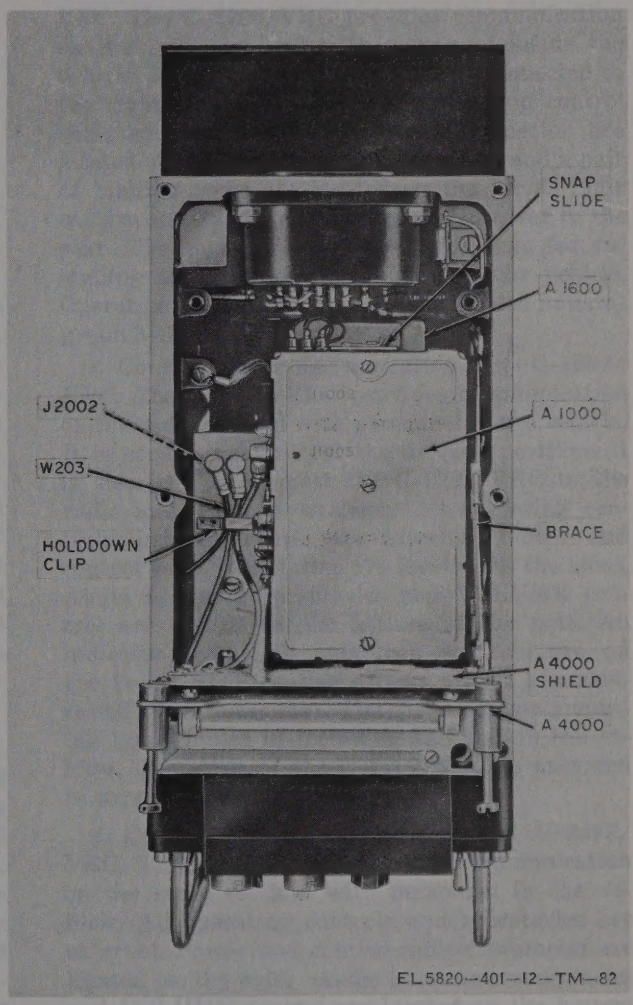


Figure 5–20. R–442(*)/VRC, bottom view with assembly A4000 raised.

CHAPTER 6

MATERIEL USED IN CONJUNCTION WITH AN/VRC–12 SERIES RADIOS

Section I. RADIO-INTERCOM SYSTEM, AUDIO ACCESSORIES, CABLE ASSEMBLIES, POWER SUPPLY, ANTENNA, AND RETRANSMISSION EQUIPMENT

6–1. General

Refer to paragraph 1–11 for information covering equipment required to make the radio systems and radio-intercom systems operational.

6–2. Description of Radio-Intercom System Equipment (fig. 2–16)

Intercommunication Set AN/VIC–1(V) is a vehicular configuration that includes Amplifier, Audio Frequency AM–1780/VRC, various quantities of Control, Intercommunication Set C–2298/VRC, and one each of Controls, Intercommunication Set C–2296/VRC and C–2297/VRC. In some installations, C–2296/VRC and C–2297/VRC are not provided. The AN/VIC–1(V) with interconnecting cable facilities comprise the radio-intercom system. The radio-intercom system provides crewmembers of a vehicle with a facility for communicating on any radio connected to the system and also for communicating with each other. The AN/VIC–1(V) is also used in some vehicles in which there is no radio equipment. A description of the components of the AN/VIC–1(V) are given in *a* through *d* below.

a. Amplifier, Audio Frequency AM–1780/VRC. The AM–1780/VRC amplifies the intercom and radio receiver output and is the main junction box of the radio system installed in vehicles. All operating controls and receptacles are external. Ten cable receptacles are located on the top, bottom, and sides. Operating controls, an indicator lamp, and two pairs of binding posts are located on the front. Eight captive screws attach a gasket-sealed cover to the rear of the unit. The cover has four mounting lugs used to mount the unit in the vehicle. Operation of the AM–1780/VRC in conjunction with the radio and the control boxes (*b*, *c*, and *d* below) is provided in paragraph 3–20.

b. Control, Intercommunication Set C–2296/VRC. The C–2296/VRC provides communication on the radio set and with personnel inside the vehicle. It has Handset H–207/VRC connected to the right side of the case. A power and control cable connector and signal lamp connector are located on the sides. Operating controls and a pair of binding posts are located on the front. Four captive screws attach a gasket-sealed cover to the rear. The cover has two mounting lugs for installing the unit on the outside of the vehicle. Operation of the C–2296/VRC is provided in paragraph 3–20.

c. Control, Intercommunication Set C–2297/VRC. The C–2297/VRC provides communication on the radio set and with personnel in the vehicle. It is usually mounted at the driver's position; it is also used to connect the C–2296/VRC to the radio and intercom systems. All operating controls and receptacles are external. Power and control cable receptacles are located on the sides. Audio accessory receptacles and VOLUME control are located on the bottom of the unit. An indicator light and operating controls are on the front. Four captive screws attach a gasket-sealed cover to the rear. The cover has two mounting lugs for use in installing the unit in the vehicle. Operation of the C–2297/VRC is provided in paragraph 3–20.

d. Control, Intercommunication Set C–2298/VRC. The C–2298/VRC provides communication on the radio set and with personnel in the vehicle. All operating controls and receptacles are external. Power and control cable-receptacles are located on the sides. Audio accessory receptacles and VOLUME control are located on the bottom of the unit. Four captive screws attach a gasket-sealed cover to the rear. The cover has two mounting lugs for use in installing the unit in the vehicle. Operation of the C–2298/VRC is provided in paragraph 3–20.

6-3. Description of Audio Accessories

The following or equivalent audio accessories can be used with the radios and radio-intercom system equipment. Information on the audio accessories is provided in paragraph 3-15.

a. Hand Microphone. The microphone used with the radio sets is Microphone, Dynamic M-80/U (fig. 3-12) (TM 11-5965-265-13). It has a push-to-talk switch, a microphone element behind which is a noise-cancelling element, and a retractile cord terminated in a five-pin connector.

b. Headsets. Typical headsets include Headsets, Electrical H-140A/U (TM 11-5965-260-15P) and H-251/U (fig. 3-12). The headsets have a pair of eachphones separated by a spring-steel band and each earphone assembly is provided with a rubber cushion to fit over the ears of the user. A retractile cord is terminated in a five-pin connector.

c. Handsets. Typical handsets include Handsets H-189/GR (TM 11-5965-280-15), H-250/U (fig. 3-11), and H-138/GR (TM 11-5965-257-15). A handset includes a microphone, earphone, and a push-to-talk switch. A retractile cord is terminated in a fivepin connector.

d. Headset-Microphone. A typical headset-micropone is Headset-Microphone H-161/U (fig. 3-12; TM 11-5865-262-13). It has a pair of earphones similar to those on the headsets (*b* above), and a microphone mounted on a boom that can position the microphone in front of the user's lips. Neck and body bands are used to attach the switch assembly to the user's body. The switch assembly contains the three-position switch and a retractile cord terminated in a pair of five-pin connectors. The retractile cord is connected to the switch assembly section by means of quick-disconnect connectors (bail-out connectors).

e. Combat Vehicle Crewman (CVC) Helmet T56-6 and Installed Audio Accessory (fig. 3-14). Each crewman is issued his own size helmet. The CVC helmet includes straps for adjusting the helmet to the user's head and for holding the earphones of the audio accessory. A typical audio accessory used in the CVC helmet is Headset-Mocrophone Kit MK-1039/G (TM 11-5965-282-15) or MK-525/G for large size helmets and MK-526/G for small size helmets (TM 11-5965-235-12). Each audio accessory has a switch assembly attached to the side of the helmet, earphones which are attached inside the helmet, a retractile cord with bail-out connectors, and terminated in a pair of five-pin connectors.

f. Loudspeaker and Extension Cord. Loudspeaker LS-454/U (fig. 3-13) (TM 11-5965-255-15P) is provided with a cord terminated in a five pin connector. The loudspeaker case has a clamp to enable the unit to be mounted in a convenient place near the radio. Cable Assembly, Special Purpose, Electrical CX-7867/VRC (of various lengths) can be used between the equipment and the loudspeaker to enable the loudspeaker to be located at a distance from the equipment.

6-4. Cable Assemblies Used with Radio Sets and Radio-Intercom System Equipment (fig. 2-17)

Following are typical cable assemblies that may be used with the radios and the radio-intercom system equipment. Each cable assembly is available in various lengths suitable to the vehicle in which it is used. Most of the cable assemblies are shown installed in figures 2-20 through 2-35.

a. Cable Assembly, Special Purpose, Electrical CX-4722/VRC. This cable assembly is the control cable between the receiver-transmitters and the antenna matching unit. It has two 12-terminal connectors; a male on one end and female on the other. For information on CX-4722A/VRC, see paragraph 1-6c(7).

b. Cable Assembly, Radio Frequency CG-1773/U. This RF antenna cable assembly is used to connect the radio to the antenna. It is type RG-58/U cable terminated on one end with right-angle BNC connector and on the other end with a straight BNC connector. An Adapter UG-306/U is provided in some installations (fig. 2-5) for use with the CG-1773/U to provide less strain on the CG-1773/U in its position in the equipment.

c. Cable Assembly, Radio Frequency CG-1127/U. This is a short RF cable assembly used between two R-442(*)/VRC's. It is type RG-58/U terminated on both ends with a right-angle connector.

d. Cable Assembly, Special Purpose, Electrical CX-4723/VRC. This cable is the type most commonly used throughout the radio-intercom system. It is terminated in 18-terminal male connectors at both ends.

e. Cable Assembly, Special Purpose, Electrical CX-7055/VRC. This cable has a 14-terminal female connector on one end and a nine-terminal connector on the other.

f. Cable Assembly, Special Purpose, Electrical CX-7056/VRC. This cable has a nine-terminal male connector on one end and a 14-terminal male connector on the other.

g. Cable Assembly, Special Purpose, Electrical CX-7057/VRC. This cable has a 14-terminal female connector on one end and a nine-terminal male connector on the other.

h. Cable Assembly, Special Purpose, Electrical CX-7058/VRC. This cable has an 9-terminal male connector on each end.

i. Cable Assembly, Special Purpose, Electrical CX-7059/VRC. This cable has a 19-terminal male connector on one end and an 18-terminal male connector on the other.

j. Cable Assembly, Special Purpose, Electrical CX-7060/VRC. This cable has an 18-terminal male connector on one end and a 14-terminal male connector on the other.

k. Cable Assembly, Special Purpose, Electrical CX-7328/VRC. This cable has an 18-terminal male connector on one end and a 10-terminal male connector on the other.

l. Cable Assembly, Special Purpose, Electrical CX-7555/VRC. This cable assembly has an 18-terminal male connector on one end and a 10-terminal male connector on the other.

m. Cable Assembly, Special Purpose, Electrical CX-7621/VRC. This is a short two-wire cable terminated on one end with a four-terminal male connector on one end and a pair of tinned wires on the other. The cable is used to connect the external lamp on the outside of some vehicles to the C-2296/VRC.

n. Cable Assembly, Power, Electrical CX-4720/VRC (fig. 2-13). This power cable is terminated on one end with a four-terminal female connector and on the other end the four wires are paired and tinned. The tinned pairs are connected to terminal lugs or a Bendix connector.

o. Cable Assembly, Power, Electrical CX-4721/VRC (fig. 2-13). This power cable is terminated on one end with a four-terminal female connector and a four-terminal male connector on the other.

6-5. Power Supply PP-2953(*)/U

The PP-2953(*)/U (TM 11-6130-233-12) is used to provide regulated 27.2 volts dc from an ac power source. It may be used in fixed installations to provide power for a receiver-transmitter. It may also be used to power the radio during troubleshooting operations.

a. Ac power sources may be 115 volts, 50-60 Hz, 4 amperes maximum; 230 volts, 50-60 Hz, 2 amperes, maximum; and 115 volts 400 Hz, 4 amperes, maximum.

b. The regulated 27.2 volts output (fixed; but variable to 22 volts output by internal control) is applied through CX-4721/VRC and MT-1029/VRC to the receiver-transmitter.

c. Transformer, Variable Power TF-523/U (TM 11-5950-212-15) can be used with the PP-2953(*)/U to provide controlled ac input when the ac power source voltage is beyond the ac input limits of the PP-2953(*)/U.

6-6. Antenna Equipment RC-292

The RC-292 is a ground-plane whip antenna that will increase the communication range of the AN/VRC-12 series radios. It consists of a 30-foot mast; a 68-foot, 50-ohm leadin cable, and antenna sections to provide a 30-degree ground plane and upright antenna section. The length of the ground plane and the upright antenna section depend on the operating frequency of the radio. Refer to TM 11-5820-348-15 for installation instructions. When the antenna is used with the radio set, the matching unit of the Antenna AS-1729/VRC or AT-912/VRC is not used. The RC-292 is shown connected in figure 6-17.

6-7. Retransmission Cable Kit MK-456A/GRC

a. The MK-456A/GRC (fig. 6-1) consists of a canvas bag to store the 50-foot cable assembly CX-4656A/GRC which has two network boxes, one of which is provided with a receptacle for connecting an audio accessory to monitor the retransmission of one of the circuits. Cable connectors at the ends are connected to the radios in the retransmission system. The MK-465A/GRC is used to interconnect two radios together to enable them to act as a relay for other radios that are too far apart to communicate directly with each other.

b. The MK-465A/GRC can be used between the receiver-transmitters of the AN/PRC-25, AN/PRC-77, AN/VRC-53, AN/GRC-125, and AN/GRC-160; between the receiver-transmitters of these radios and the receiver-transmitters of

the AN/VRC-12 series radio; and between the AN/VRC-12 series radios receiver-transmitters. The radios that are set up in retransmission are separated by the full length of the CX-4656A/GRC and they must be operated in squelch mode.

c. The frequencies of the two relay site radios are selected for noninterference. The frequencies selected must be at least 10 MHz apart. Use the retransmission interference charts (fig. FO-1) and the information given in paragraph 2-2*b* (4) to select noninterfering frequencies for the receiver-transmitters used in the retransmission site radios.

d. To provide for retransmission, proceed as follows. Refer to figure 6-2 for connections and control setting details required for the retransmission operation. Refer to figure FO-8 for the circuits of the receiver-transmitter and RT-505/PRC-25 or RT-841/PRC-77 involved with the retransmission through the CX-4656A/GRC.

(1) Connect the CX-4656A/GRC to the radio sets (radio sets 2 and 3, fig. 6-2) at the retransmission site. Separate the two radios the full length of the CX-4656A/GRC. The full separation is required to reduce interference of radio transmitting power from interfering with the audio signals in the cable assembly.

(2) First establish communication with each terminal radio (between radio sets 1 and 2, and between 3 and 4) *without* squelch mode operation.

(3) When communication is satisfactory, ar-

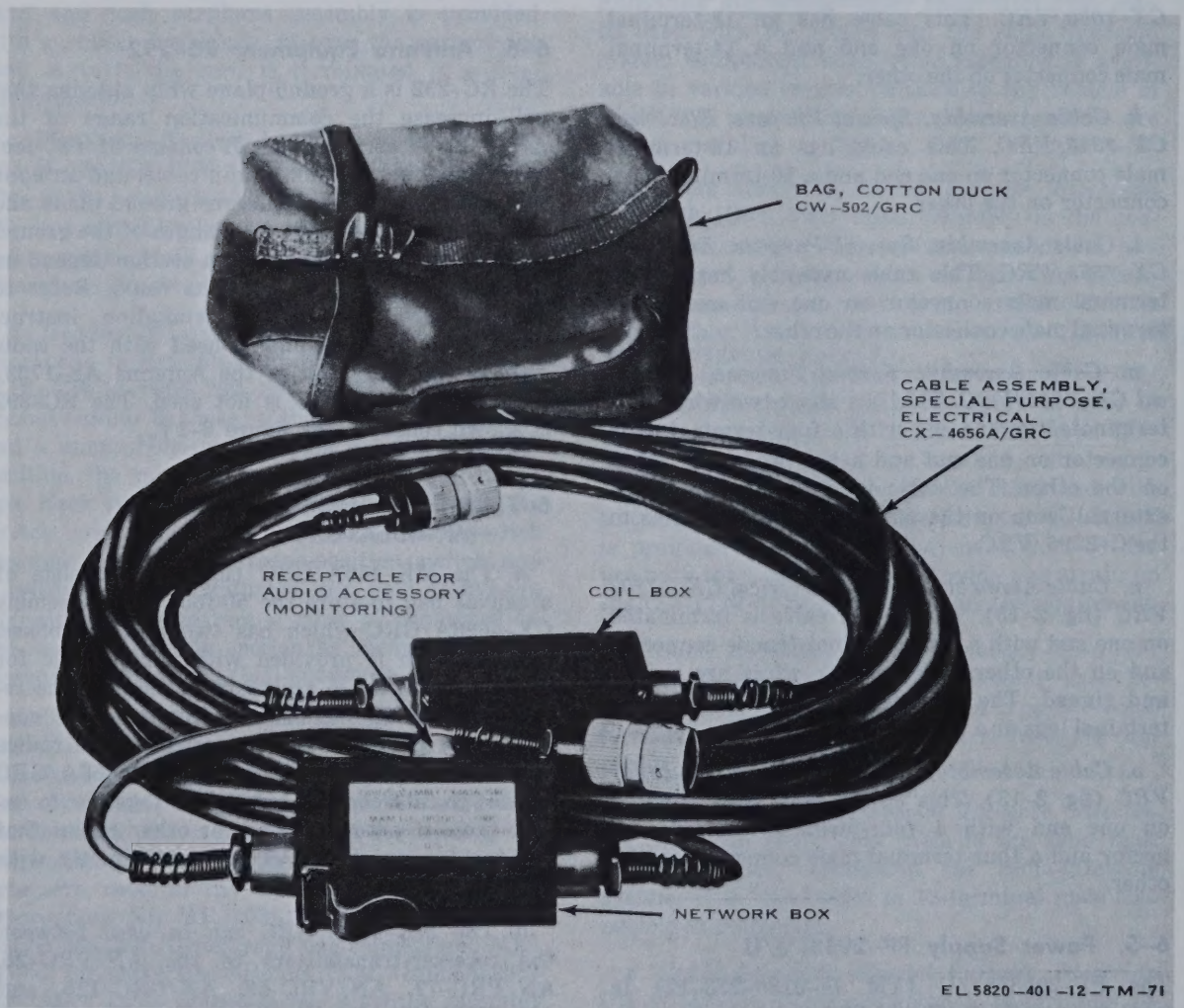
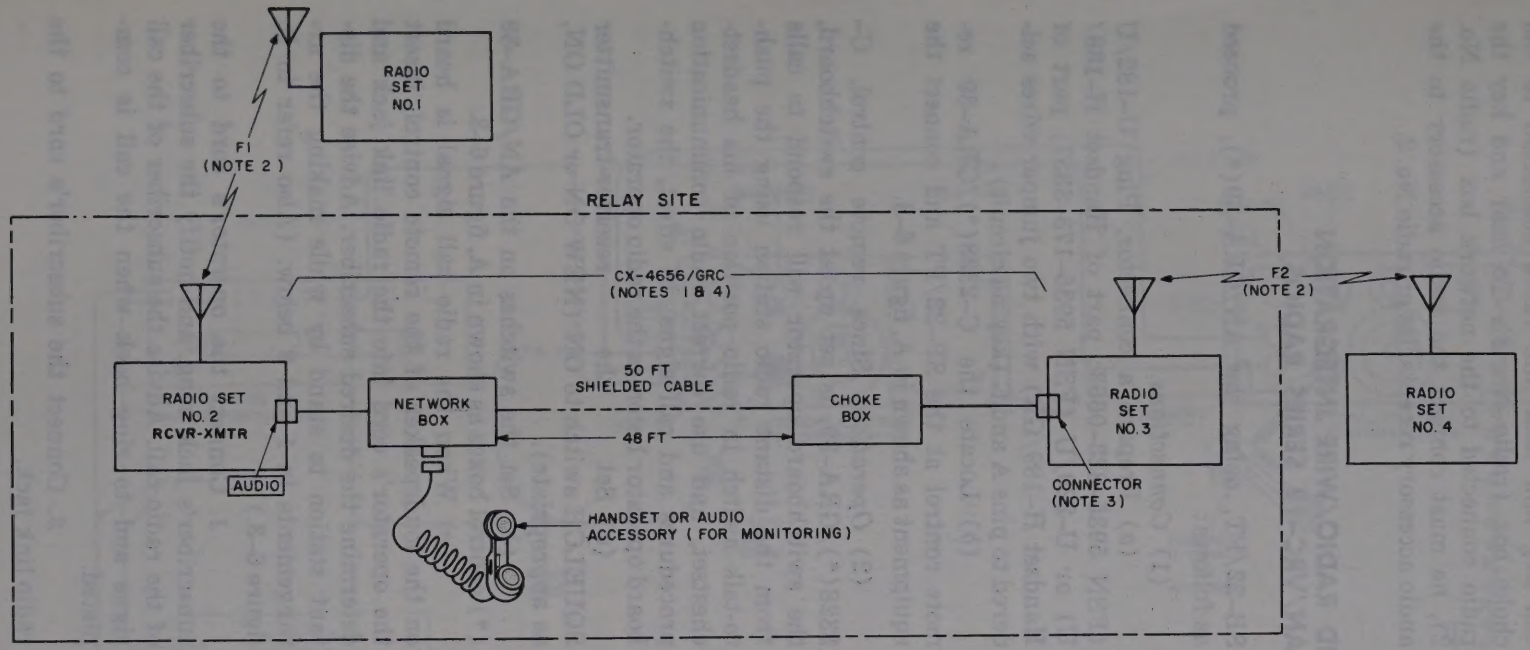


Figure 6-1. Retransmission Cable Kit MK-456A/GRC, components.



NOTES:

1. PART OF MK-456/GRC.
2. FREQUENCIES FOR F1 AND F2 ARE SELECTED FOR NON-INTERFERENCE.
3. WHEN RT-505/PRC-25 OR RT-841/PRC-77 IS USED, CONNECT CABLE TO [AUDIO] CONNECTOR; WHEN RT-246/VRC OR RT-524/VRC IS USED, CONNECT CABLE TO [RETRANSMIT R/W] CONNECTOR.
4. RADIO SETS NO.2 AND NO.3 AT RELAY SITE SEPARATED BY FULL LENGTH (50 FT) OF CX-4656/GRC.
5. [ ] INDICATES EQUIPMENT MARKING.
6. SWITCH POSITIONS REQUIRED FOR VARIOUS RADIOS IN THE RADIO RELAY NET, AS SHOWN IN TABLE.

TERMINAL RADIO		RADIO RELAY SITE				TERMINAL RADIO	
RADIO SET NO.1		RADIO SET NO.2		RADIO SET NO.3		RADIO SET NO.4	
RADIO	SWITCH	RADIO	SWITCH	RADIO	SWITCH	RADIO	SWITCH
RT-246/VRC OR RT-524/VRC OR	SQUELCH: NEW ON, NEW OFF, OR OLD OFF	RCVR-XMTR RT-246/VRC OR RT-524/VRC	SQUELCH NEW ON	RT-246/VRC OR RT-524/VRC OR	SQUELCH: NEW ON	RT-246/VRC OR RT-524/VRC OR	SQUELCH: NEW ON, NEW OFF, OR OLD OFF
RT-505/PRC-25 OR RT-841/PRC-77 OR	FUNCTION: SQUELCH OR ON			RT-505/PRC-25 OR RT-841/PRC-77	FUNCTION: RETRANS	RT-505/PRC-25 OR RT-841/PRC-77 OR	FUNCTION: SQUELCH OR ON
AN/ARC-54, AN/ARC-131, ETC	SQUELCH: TONE					AN/ARC-54, AN/ARC-131, ETC	SQUELCH: TONE
				RT-246/VRC OR RT-524/VRC	SQUELCH: OLD ON	COMPATABLE FM RADIO SET OTHER THAN THOSE LISTED ABOVE	NOT APPLICABLE

EL5820-401-12-TM-117

Figure 6-2. Connections and conditions for retransmission operation using Retransmission Cable Kit MK-456A/GRC between receiver-trans-transmitters.

range for squelch mode operation and check for communication between the radio sets (1 and 2, 3 and 4). See paragraph 3–16 for squelch mode information.

(4) Advise the terminal radios that the next communication will be between them. In the meanwhile, set the controls on the retransmission radios for retransmission (note 6, chart, fig. 6–2). Communication between the terminal radios proceeds automatically.

(5) The operator at the retransmission site can key and hear the radio connected to the choke box (radio No. 3). To hear and key the radio connected to the network box (radio No. 2), he must connect the audio accessory to the audio accessory receptacles of radio No. 2.

Section II. REMOTE CONTROL AND RADIO/WIRE INTEGRATION (RWI) EQUIPMENT USED WITH AN/VRC–12 SERIES RADIOS

6–8. Radio Set Control Group AN/GRA–39(*)

NOTE

Radio Set Control Group AN/GRA–39(*) represents AN/GRA–39, AN/GRA–39A, and AN/GRA–39B; Control, Radio Set C–2328(*)/GRA–39 represents C–2328/GRA–39, C–2328A/GRA–39, and C–2328B/GRA–39; Control, Radio Set C–2329(*)/GRA–39 (local control) represents C–2329/GRA–39, C–2329A/GRA–39, and C–2329B/GRA–39.

The AN/GRA–39(*) may be used to provide remote control of radio transmission and reception of the receiver-transmitters up to approximately 2 miles (3.3 km approx) (*a* below). This equipment may also be used to provide radio-wire integration (RWI) between Switchboard, Telephone SB–22/PT (TM 11–5805–262–12) and the receiver-transmitters (*b* below). Installation and operating instructions for the AN/GRA–39 (*) are provided in TM 11–5820–477–12.

a. Remote Radio Control.

(1) *Connections.* Connect the AN/GRA–39 (*) to the receiver-transmitter as shown in A, figure 6–3. Connect the field wires between the AN/GRA–39(*) control boxes. (The connections to the SB–22/PT are for RWI operation (*b* below).)

(2) *Operation.*

(*a*) Tune the receiver-transmitter to the assigned frequency, using squelch or non-squelch mode operation, as desired. Use push-to-talk operation to control the receiver-transmitter from the AN/GRA–39(*).

(*b*) Refer to TM 11–5820–477–12 for procedures to use the AN/GRA–39(*) for remote control of the receiver-transmitter.

b. Radio-Wire Integration (RWI). To provide RWI between the receiver-transmitter and an SB–22/PT, using the AN/GRA–39(*), proceed as follows:

(1) *Connections.*

(*a*) Prepare a connector, Plug U–182/U (FSN 5935–823–0663; part of Handset H–138/U) or U–229/U (FSN 5935–173–8357; part of Handset H–189/GR) with two jumper wires soldered to pins A and C (keying circuit).

(*b*) Locate the C–2328(*)/GRA–39 remote control at the SB–22/PT and connect the equipment as shown in A, figure 6–3.

(2) *Operation.* Since remote control, C–2328(*)/GRA–39, is set up at the switchboard, the switchboard operator will respond to calls from the distant radio station using the push-to-talk switch in radio position of his headset-chestset, and use correct radio communication procedures and call signs. In effect, the switchboard operator becomes the radio operator.

(*a*) Set the receiver-transmitter SQUELCH switch to ON (NEW ON or OLD ON, as appropriate).

(*b*) Set the switches on the AN/GRA–39 (*) control boxes as shown in A, figure 6–3.

(*c*) When the radio call signal is heard on the loudspeaker of the remote control, insert the operator's cord into the radio link jack and determine the desired subscriber. Advise the distant station to stand by while making the arrangements in *1* and *2* below. (Also refer to B, figure 6–3.)

1. Connect the operator's cord to the subscriber's jack, ring, and notify the subscriber of the radio call. Advise the subscriber of the call signs and to ring back when the call is completed.

2. Connect the subscriber's cord to the radio link jack.

NOTE

Operation of the switchboard headset-chestset switch to push-to-talk *radio*

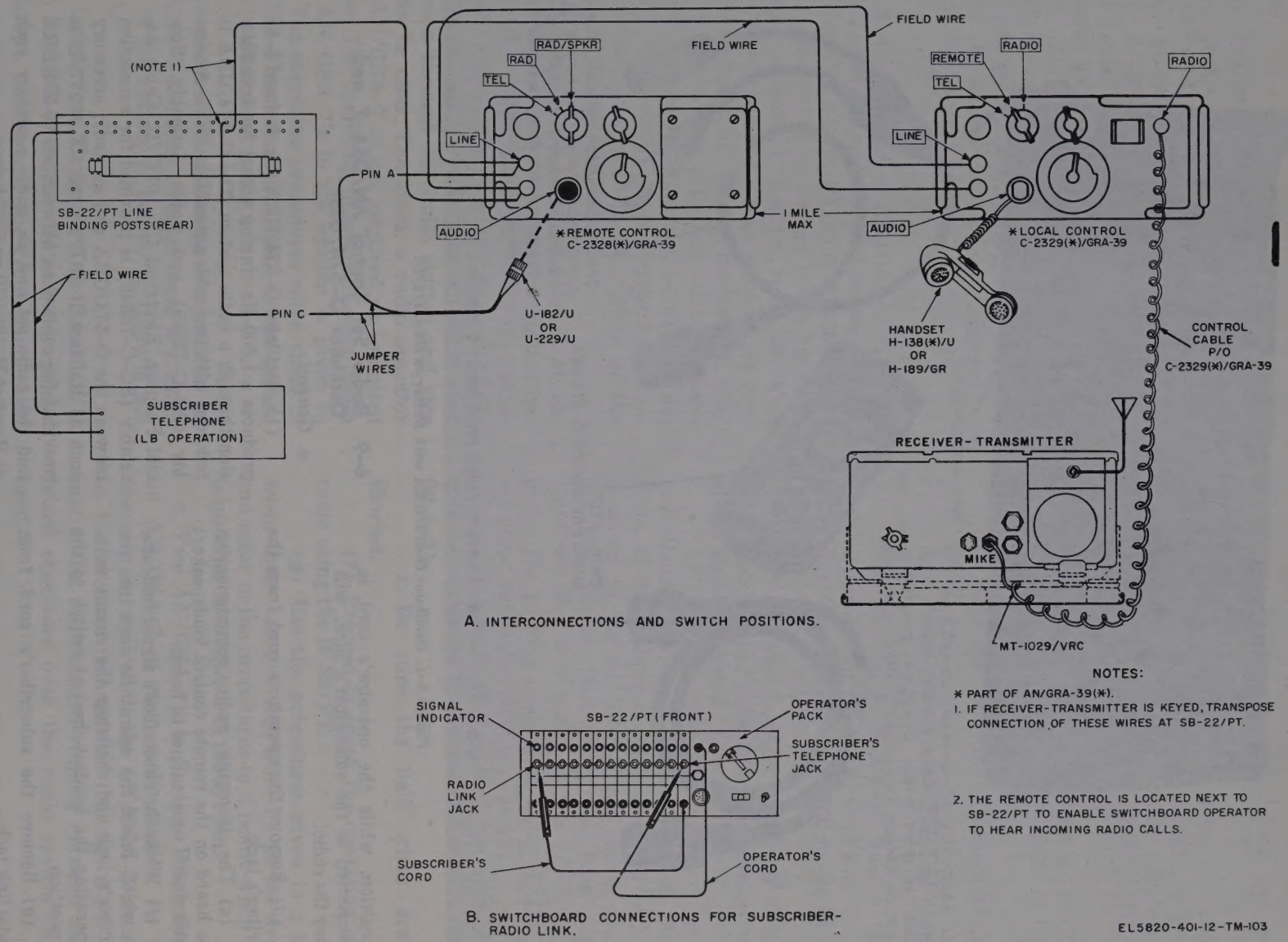


Figure 6-3. Use of AN/GRA-39(*) for remote control and radio/wire integration with AN/VRC-12 series radios.

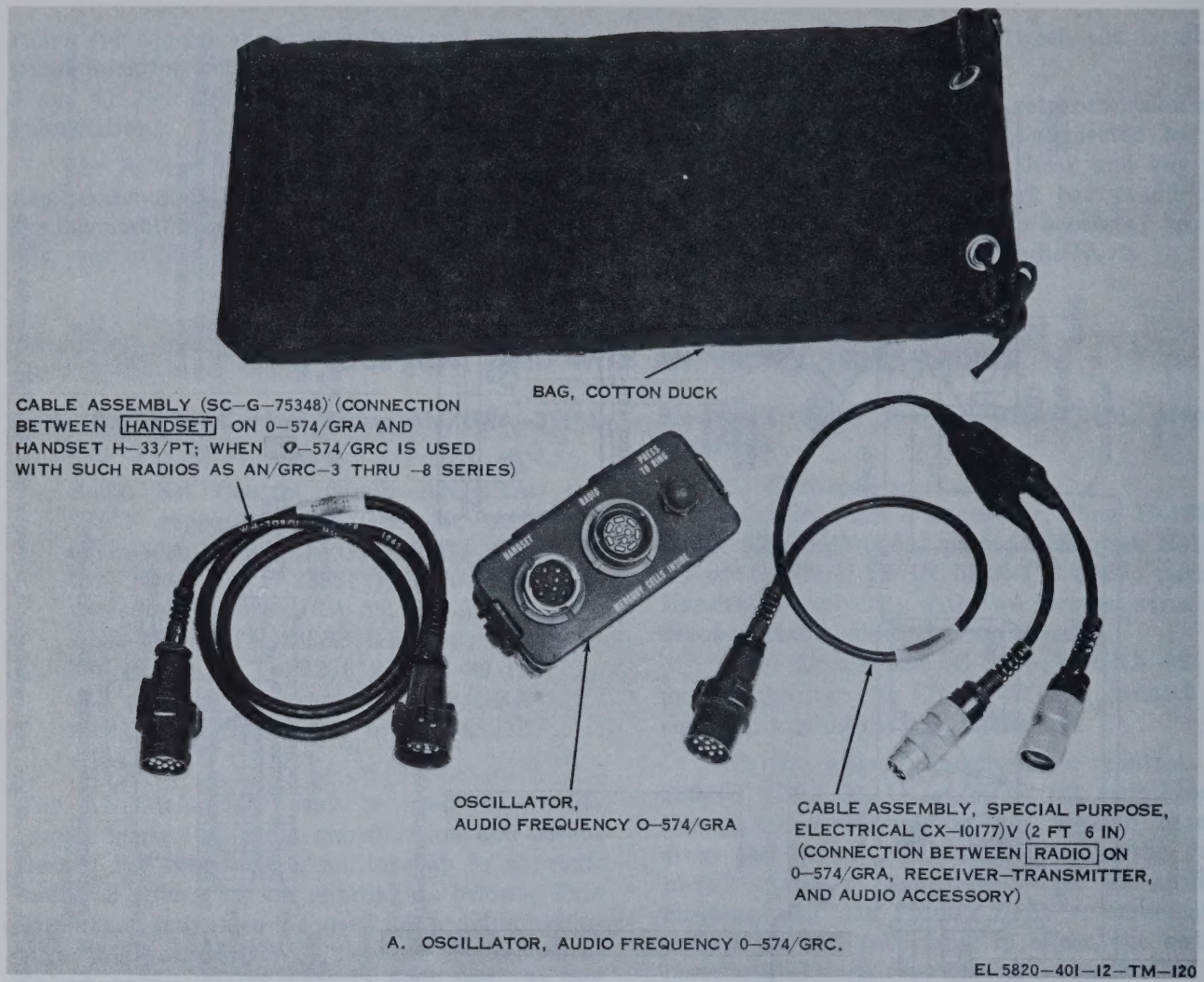

BAG, COTTON DUCK
CABLE ASSEMBLY (SC-G-75348) (CONNECTION BETWEEN HANDSET ON O-574/GRA AND HANDSET H-33/PT; WHEN O-574/GRC IS USED WITH SUCH RADIOS AS AN/GRC-3 THRU -8 SERIES)
OSCILLATOR, AUDIO FREQUENCY O-574/GRA
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-10177)V (2 FT 6 IN) (CONNECTION BETWEEN RADIO ON O-574/GRA, RECEIVER-TRANSMITTER, AND AUDIO ACCESSORY)
A. OSCILLATOR, AUDIO FREQUENCY O-574/GRC.
EL 5820-401-12-TM-120

Figure 6-4. Oscillator O-574/GRA with Batteries BA-1312/U.

position, while the operator's cord is connected to the subscriber's jack, will key the radio.

(*d*) Remove the operator's cord from the subscriber's jack.

(*e*) The incoming radio communication can be heard on the remote control loudspeaker; the subscriber's voice cannot be heard.

(*f*) When the subscriber's signal indicator shows white, insert the operator's cord into the subscriber's jack and challenge the circuit without operating the headset-chestset switch to the *radio* position.

(*g*) Remove the subscriber's cord from the radio link jack.

6-9. Radio Set Control AN/GSA-7 and Oscillator O-574/GRA

a. General.

(1) Oscillator O-574/GRA (fig. 6-4 and 6-5) produces a 1,600-Hz ringing signal for transmission through a radio system. The O-574/GRA is provided with two cable assemblies: Cable Assembly (SC-C-75348) and Cable Assembly, Special Purpose, Electrical CX-10177/U. Cable Assembly (SC-C-75348) is provided for connection between the O-574/GRA and an audio accessory such as Handset H-33/PT; the CX-10177/U is provided for connection between the O-574/GRA and the radio set and an audio accessory such as Handset H-189/GR or CVC helmet.

NOTE

The O-574/GRA may be used with other radios such as AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 (TM 11-5820-498-12), AN/PRC-25 (TM 11-5820-398-12), AN/PRC-77 (TM 11-5820-667-12), and AN/GRC-3 through AN/GRC-8. The O-574/GRA is provided to the radio sets in a RWI network to enable the radio operator to ring into the switchboard which is connected to another radio set through Radio Set Control AN/GSA-7 ((2) below).

(2) Radio Set Control AN/GSA-7 (TM 11-5135-15) is used to provide RWI between Switchboard, Telephone SB-22/PT (TM 11-5805-262-12) and a radio that is located up to 10 miles (16 km approx) distant from the radio set. With the AN/GSA-7, there are four methods of providing RWI, depending on the number of AN/GSA-7's in the system (fig. 6-8). Cable Assembly, Special Purpose, Electrical CX-7474/U (fig. 6-7) (FSN 5995-985-7561) is required for connection between the receiver-transmitter of the radio set and the AN/GSA-7.

(*a*) When there is a AN/GSA-7 at the other station (A, fig. 6-8) or another station has an O-574/GRA (C, fig. 6-8), the AN/GSA-7 ringing feature (converting the switchboard 20-Hz ringing signal to 1,600-Hz ringing signal for transmission through the radio station and vice versa) can be used. Therefore, a radio operator at each AN/GSA-7 is not required as indicated in *b* below. The operating procedures when there are two AN/GSA-7's in the system is given in *c* below. The operating procedures when there is an AN/GSA-7 and an O-574/GRA is the system are given in *d* below.

b. Connections. The following connections at the AN/GSA-7 are used whether there is a radio operator in the system (*c* below) or there is not (*d* below).

(1) Install four Batteries, Dry BA-1312/U (fig. 6-6) in the O-574/GRA. Unlatch the spring-loaded clamps, and remove the front panel with the chassis attached. Install the four batteries as shown in the diagram on the tubular battery case. The spring-loaded contact assembly in the bottom of the battery case will cause the top battery to protrude slightly. Screw on the threaded battery case cover completely. Replace the chassis in the case and tighten the spring-loaded clamps.

(2) Interconnect the AN/GSA-7 and receiver-transmitter with the CX-7474/U (A, fig. 6-8). Do not connect the monitor telephone unless there is no radio operator at the AN/GSA-7 (*d*(2) below).

(3) Set the receiver-transmitter SQUELCH switch to OFF (NEW or OLD). Tune in the desired radio station.

(4) Make the following adjustments on the AN/GSA-7:

(*a*) Connect the AN/GSA-7 to a power source (TM 11-5135-15).

(*b*) Set the OFF-AC-DC switch to AC or DC, depending on the power source used.

(*c*) Connect the H-33/PT to the AUDIO connector.

(*d*) Set the monitor switch to T-RAD& MON. The rushing noise from the receiver-transmitter should be heard.

(*e*) Connect the field wires from the switchboard to the AN/GSA-7 LINE binding posts. If the rushing noise ceases, and beeps originating in the AN/GSA-7 are heard (indicating the receiver-transmitter has been keyed), transpose the field wires at the LINE binding posts. The rushing noise should stop. If this does not occur, make the following checks:

1. Check to see that no switchboard cord is connected to the radio link jack (B, C, fig. 6-9).

2. Be sure the field wires are not shorted.

(*f*) Proceed to check the operation of the radio using the H-33/PT.

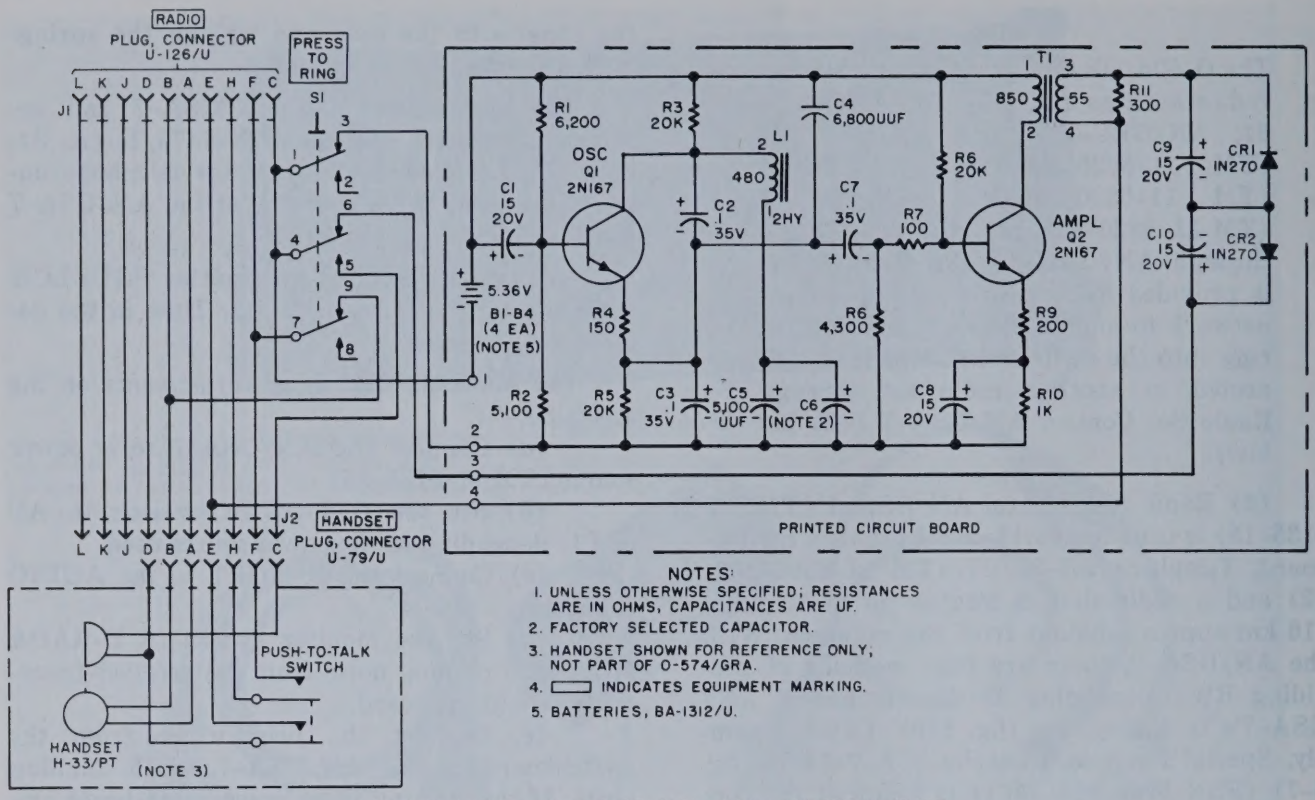
(*g*) Use the procedures given in *c* below when there are two AN/GSA-7's in the system, and refer to the procedures in *d* below when there is no other AN/GSA-7 in the system.

c. Two AN/GSA-7's in System. When there is an AN/GSA-7 at each radio station, no radio operator is required at the AN/GSA-7 connected to the receiver-transmitter (A, fig. 6-8). Normal 20-Hz switchboard ringing between switchboard operators over the radio system can be used.

(1) Interconnect the AN/GSA-7 and radio equipment (*b* above).

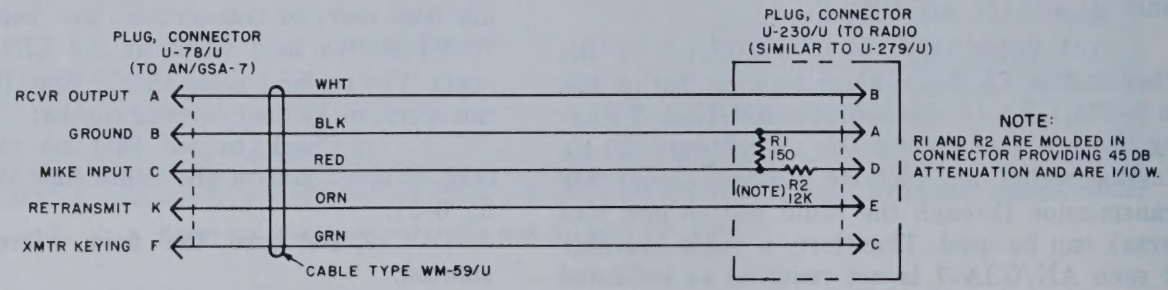
(2) On each AN/GSA-7, set the monitor switch to T-RAD&MON position.

(3) Set the switch on the subscriber's telephone to LB operation (local battery).



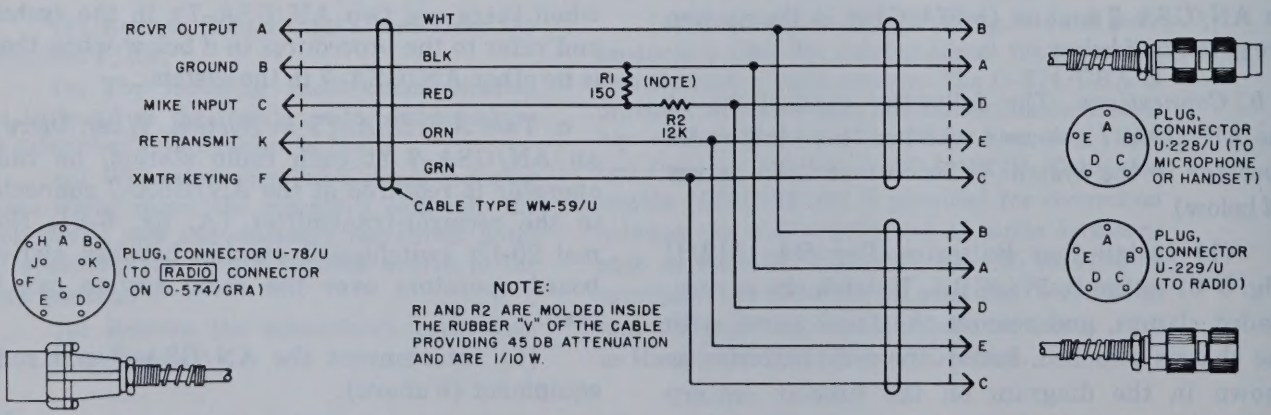
NOTES:
1. UNLESS OTHERWISE SPECIFIED; RESISTANCES ARE IN OHMS, CAPACITANCES ARE UF.
2. FACTORY SELECTED CAPACITOR.
3. HANDSET SHOWN FOR REFERENCE ONLY, NOT PART OF O-574/GRA.
4. ▭ INDICATES EQUIPMENT MARKING.
5. BATTERIES, BA-1312/U.

A. OSCILLATOR, AUDIO O-574/GRA WITH HANDSET H-33/PT.



NOTE:
R1 AND R2 ARE MOLDED IN CONNECTOR PROVIDING 45 DB ATTENUATION AND ARE 1/10 W.

B. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-7474/U.



NOTE:
R1 AND R2 ARE MOLDED INSIDE THE RUBBER "V" OF THE CABLE PROVIDING 45 DB ATTENUATION AND ARE 1/10 W.

C. CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL CX-10177/U (2 FT., 6 IN.).

EL5820-401-12-TM-121

Figure 6-5. Schematic diagrams of Oscillator, Audio Frequency O-574/GRA, and cables CX-7474/U and CX-10177/U.

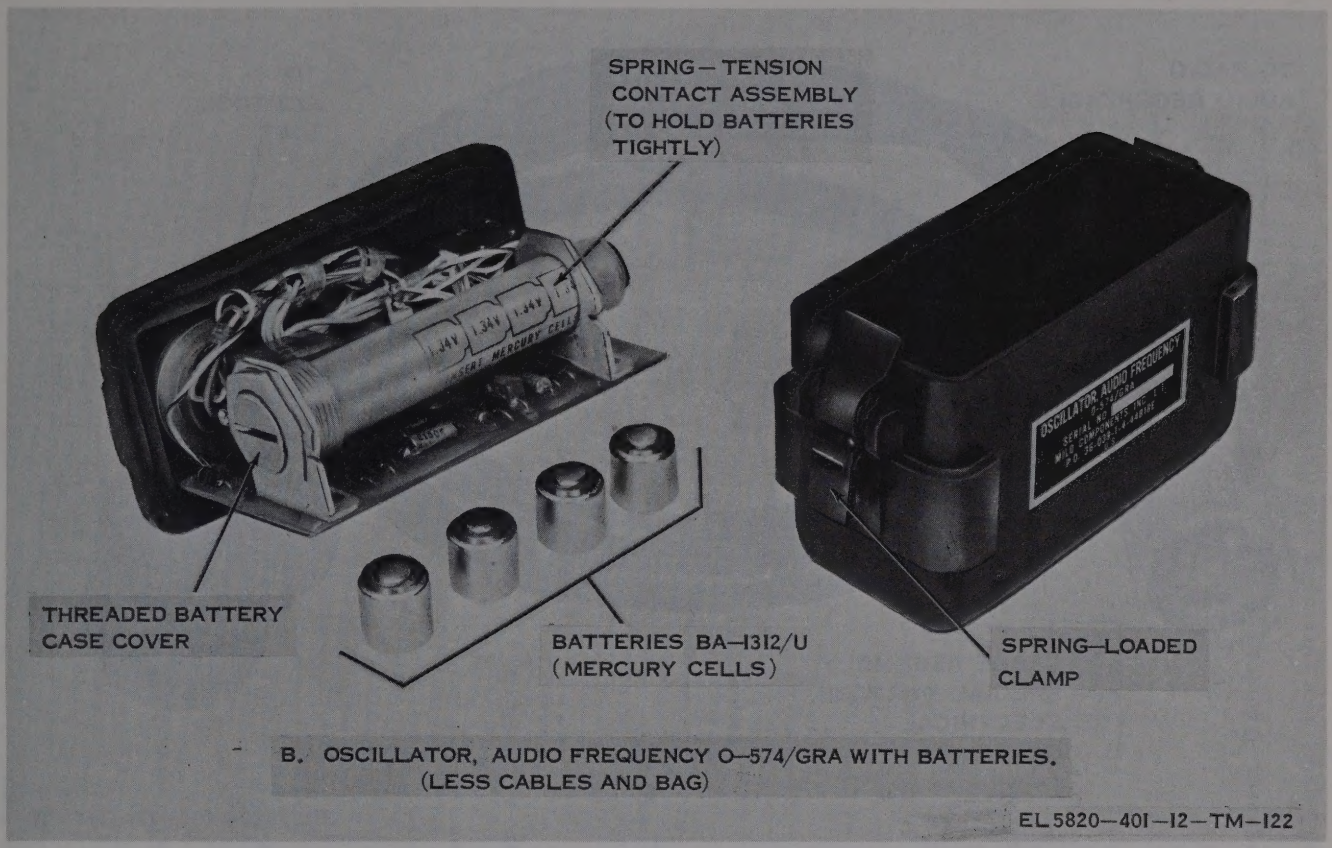

SPRING—TENSION CONTACT ASSEMBLY (TO HOLD BATTERIES TIGHTLY)
THREADED BATTERY CASE COVER
BATTERIES BA-1312/U (MERCURY CELLS)
SPRING-LOADED CLAMP
B. OSCILLATOR, AUDIO FREQUENCY O-574/GRA WITH BATTERIES. (LESS CABLES AND BAG)
EL 5820-401-12-TM-122

Figure 6-6. Installation of batteries in O-574/GRA.

(4) Switchboard and subscriber telephone operation proceed normally for radio operation. Use the hand generator (20 Hz) to call the distant switchboard operator; use push-to-talk radio operation with the proper call signs and radio procedures.

d. One AN/GSA-7 in System. When there is no AN/GSA-7 at the other radio station, there are three methods of providing RWI. In one arrangement ((1) below), a radio operator is stationed at the AN/GSA-7 to make the RWI arrangements with the switchboard operator (B, fig. 6-8). In the second arrangement ((2) below), a telephone at the switchboard is continuously connected to the radio system; therefore, the switchboard operator answers radio calls and makes RWI connections, becoming a radio operator for the operation (D, fig. 6-8). For a third arrangement ((3) below), the distant radio station operator is provided with Oscillator O-574/GRA, which will provide the 1,600-Hz signal to ring through an unattended AN/GSA-7 to call the switchboard (C, fig. 6-8).

(1) *Radio operator at AN/GSA-7* (B, fig. 6-8). These procedures require a radio operator at the AN/GSA-7.

(*a*) Interconnect the AN/GSA-7 equipment (*b* above).

(*b*) At the AN/GSA-7, set the monitor switch to T-RADIO&MON position. Use the H-33/PT to communicate with the distant radio station.

(*c*) When RWI is required for communication with a switchboard subscriber, advise the distant radio station to standby while the arrangements in *1*, *2*, and *3* below are being made:

1. On the AN/GSA-7, hold the monitor switch to R TEL to ring the switchboard. Release the switch and request the switchboard operator for the desired subscriber.

2. At the switchboard, the operator connects the operator's cord to the desired subscriber's jack, rings, and advises the subscriber of the radio call, call signs, and requests him to ring back when radio communication is finished.

3. The switchboard operator then connects the subscriber's cord to the radio link

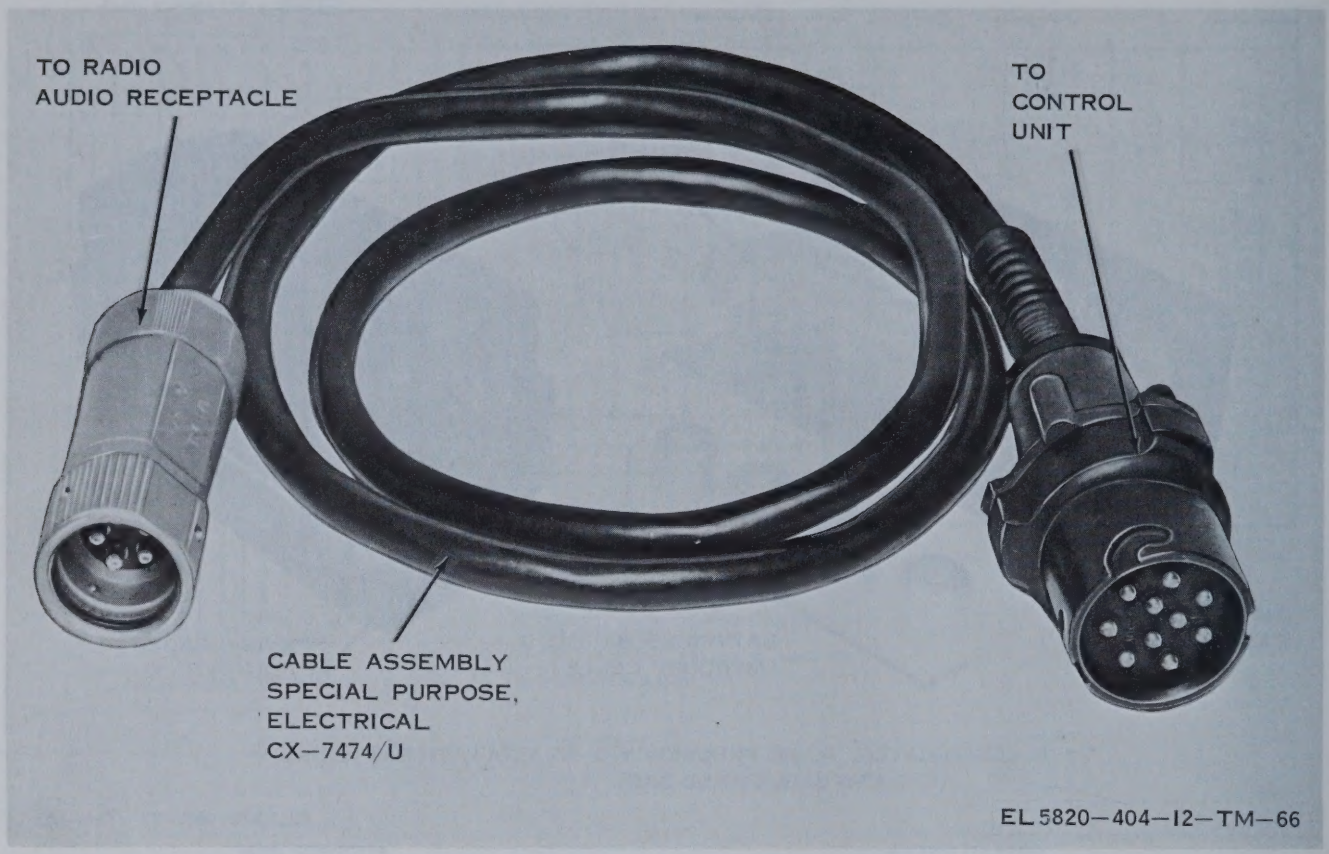


Figure 6-7. Cable Assembly, Special Purpose, Electrical CX-7474/U.

jack (B, fig. 6-9) and tells the radio operator that the subscriber is ready.

(*d*) At the AN/GSA-7, the radio operator sets the AN/GSA-7 monitor switch to T-RADIO&MON position. Communication between the subscriber and the distant radio station proceed automatically on push-to-talk basis. The radio operator at the AN/GSA-7 can monitor the communication.

(*e*) At the switchboard, the operator removes the operator's cord from the subscriber's jack during subscriber radio communication.

(*f*) When the subscriber rings off (the subscriber signal indicator will indicate white), insert the operator's cord into the subscriber's jack and challenge the circuit, without operating the headset-chestset switch to push-to-talk *radio* position (which would key the radio).

(*g*) Remove the operator's and subscriber's cords when the subscriber radio communication is finished.

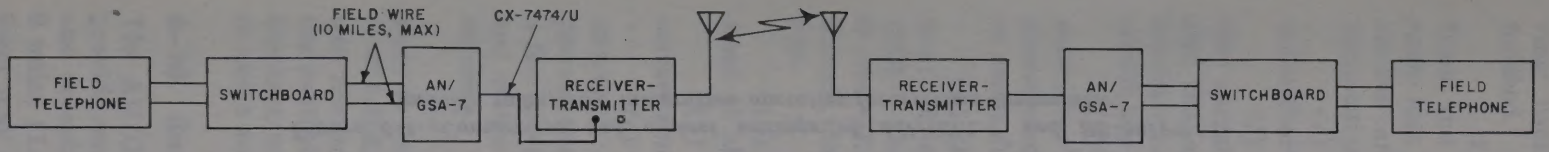
(2) *No radio operator at AN/GSA-7* (D, fig. 6-8). When there is no radio operator available at the AN/GSA-7, a monitor telephone is connected to the switchboard in the radio link jack and will be used to listen for radio calls that require RWI connections.

(*a*) Interconnect the AN/GSA-7 equipment (*b* above).

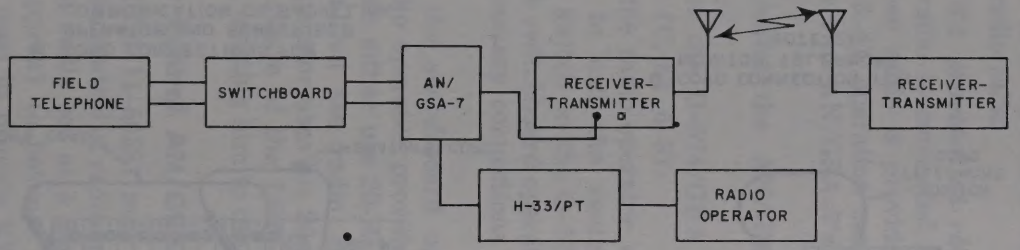
(*b*) Connect a monitor telephone to the switchboard (A, fig. 6-9); set it for LB (local battery) operation and locate the telephone handset to that the switchboard operator can hear radio calls. Connect the monitor telephone cord to the radio link jack (C, fig. 6-9).

(*c*) To communicate with the distant radio station, insert the radio operator's cord into the monitor telephone jack (C, fig. 6-9). Operate the handset-chestset switch to push-to-talk *radio* position to key the radio and communicate with the distant radio station; use proper call signs and radio procedures.

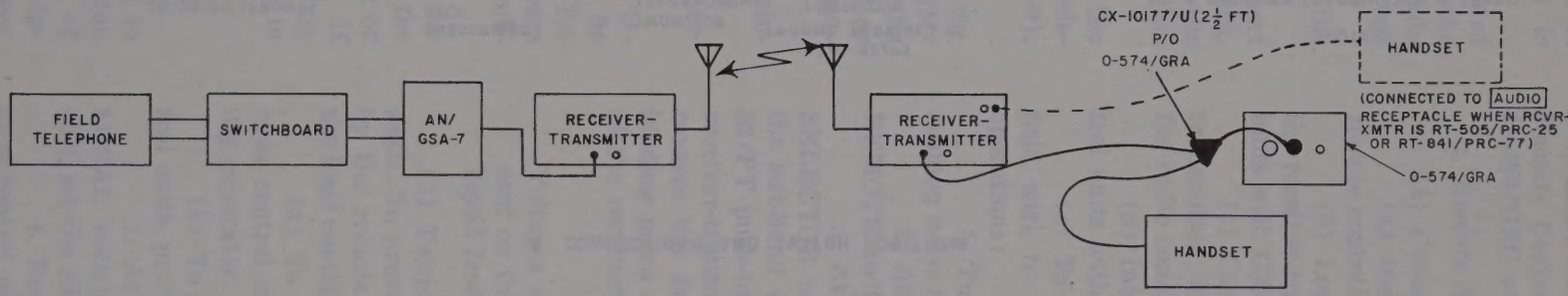
(*d*) When a radio call is heard on the monitor telephone set, use the monitor telephone to answer the call. When the desired subscriber has been determined, advise the distant radio station to standby while the arrangements in *1* and *2* below are being made.



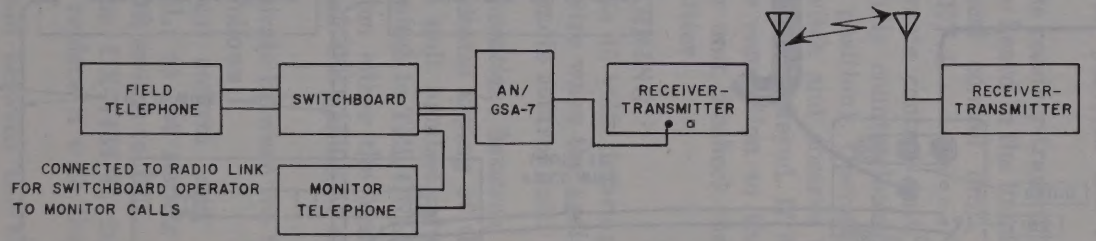
A. AN/GSA-7 AT BOTH STATIONS; RADIO OPERATOR NOT REQUIRED AT AN/GSA-7.



B. AN/GSA-7 AT ONE STATION; RADIO OPERATOR REQUIRED AT AN/GSA-7.



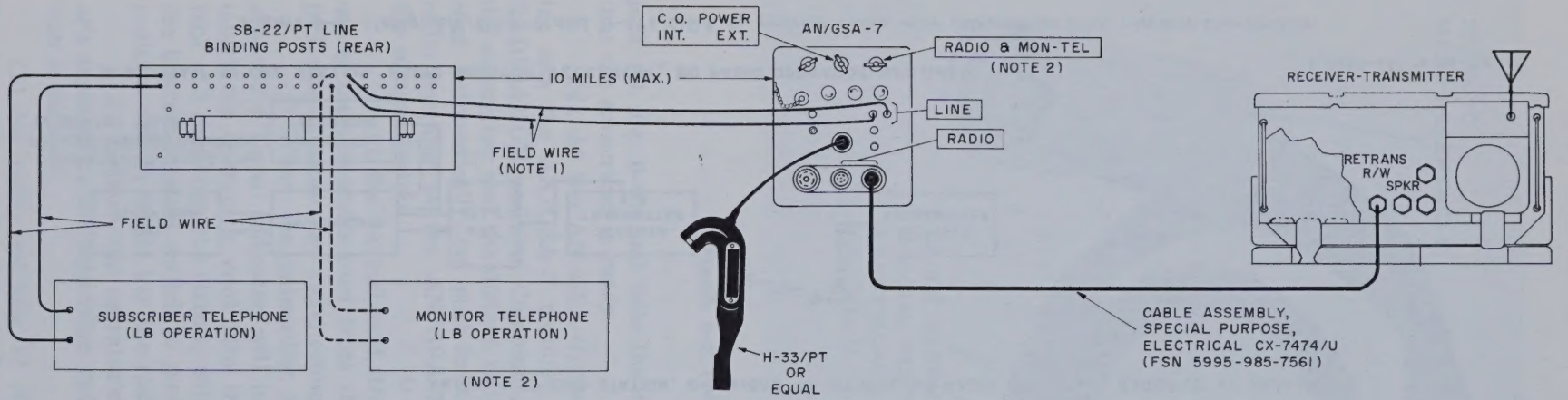
C. AN/GSA-7 AT ONE STATION, O-574/GRA AT OTHER; NO RADIO OPERATOR REQUIRED AT AN/GSA-7.



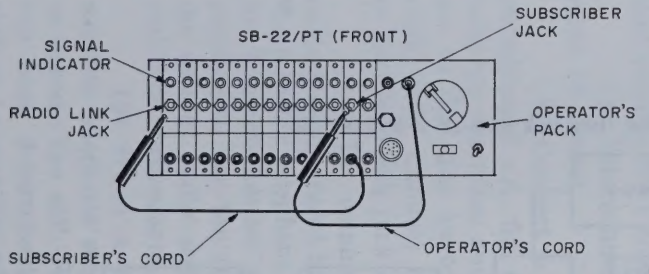
D. AN/GSA-7 AT ONE STATION, RADIO MONITOR TELEPHONE; NO RADIO OPERATOR REQUIRED.

EL5820-401-12-TM-123

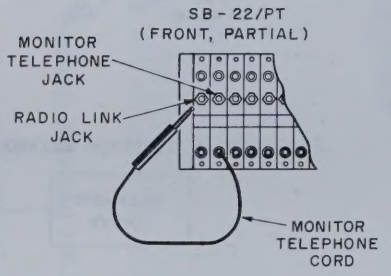
Figure 6–8. Using AN/GSA–7 and O–574/GRA to provide radio/wire integration with receiver-transmitter.



A. CONNECTIONS AND SWITCH POSITIONS.



B. CORD CONNECTIONS FOR OPERATOR AND SUBSCRIBER COMMUNICATION ON RADIO LINK.



C. CORD CONNECTION FOR MONITOR TELEPHONE (NOTE 2).

NOTES:

1. IF RECEIVER-TRANSMITTER IS KEYED, TRANSPOSE THESE CONNECTIONS AT SB-22/PT.
2. THE MONITOR TELEPHONE IS LOCATED AT SB-22/PT TO ENABLE SWITCHBOARD OPERATOR TO HEAR INCOMING RADIO CALLS ON THE HANDSET WHEN THERE IS NO OPERATOR AT THE AN/GSA-7.

EL5820-401-12-TM-118

Figure 6-9. Connections and control settings of AN/GSA-7 and SB-22/PT to provide radio/wire integration operation for receiver-transmitter.

1. Insert the operator's cord into the subscriber's jack, ring, and advise the subscriber of the radio call and call signs; request him to ring back when the radio communication is finished.

2. Remove the monitor telephone cord from, and disconnect the subscriber's cord to the radio link jack. Communication between the subscriber and the distant radio station proceed automatically with push-to-talk operation.

(*e*) Remove the operator's cord from the subscriber's jack.

(*f*) When the subscriber rings off, insert the operator's cord into the subscriber's jack, and challenge the circuit without operating the headset-chestset switch to *radio* position (this would key the radio).

(*g*) Remove the operator's cord from the subscriber's jack and reconnect the monitor telephone cord to the radio link jack (C, fig. 6–9), to await further radio calls.

(3) *O–574/GRA provided at radio* (D, fig. 6–8). When one radio is connected to the AN/GSA–7 and another radio is provided with the O–574/GRA (fig. 6–4), operation can proceed as though there were two AN/GSA–7's in the system.

(*a*) Interconnect the AN/GSA–7 equipment (*b* above).

(*b*) Connect the O–574/GRA to the receiver-transmitter (C, fig. 6–8).

(*c*) When the radio operator with the O–574/GRA desires to call the switchboard, he presses the RING switch on the O–574/GRA for a few seconds. The switchboard operator answers and makes the necessary connections to the subscribers.

(*d*) When the switchboard operator desires to call a radio operator provided with the O–574/GRA, he can either use 20-Hz ringing or use the call signal on the radio link line. If the switchboard operator uses his 20-Hz ringing, the user must be aware of the 1,600-Hz buzz in in audio accessory, alerting him to the call.

6–10. Radio Set Control AN/GRA–6

The AN/GRA–6 (TM 11–5038) may be used to provide remote radio control of radio transmission and reception of a radio set at a separation of 2 miles (1.6 km approx) (*a* below). This equipment may also be used to provide RWI between Switchboard, Telephone SB–22/PT (TM 11–5905–262–12) and the radio set (*b* below). Cable Assembly, Special Purpose, Electrical CX–7474/U (fig. 6–7) (FSN 5995–985–7561) is required for the connection between the receiver-transmitter and Local Control C–434/GRC (A, fig. 6–10). Remote Control C–433/GRC is connected to the C–434/GRC with field wire.

a. Remote Radio Control.

(1) *Connections.*

(*a*) Install the batteries in the local and remote control units of the AN/GRA–6.

(*b*) Locate the local control unit next to the receiver-transmitter and interconnect the two units with CX–7474/U (A, fig. 6–10).

(*c*) Connect a handset to the receiver-transmitter; it will be used by the radio operator for radio communication.

(*d*) Interconnect the local and remote control units with field wire.

(*e*) To check for proper connection of the field wire to the units, perform the following operations:

1. Turn on the receiver-transmitter. The rushing noise should be heard in the handset.

2. At the local control unit, set the REMOTE switch to SET 1.

3. At the remote control unit, set the SELECTOR switch fully counterclockwise (for the left-hand write-in position). Operate the H–33/PT push-to-talk switch and observe that the receiver-transmitter has been keyed. If it is not, reverse the field wire connection to the LINE binding posts of either unit. Recheck the keying of the receiver-transmitter.

WARNING

Voltages as high as 45 volts dc are present on the field wire when the radio is keyed from the remote control unit.

(2) *Telephone operation between control units.* To prevent accidental keying of the radio by the remote control unit handset, always set the local control unit switch to TEL ONLY.

(*a*) To ring from either the local or remote control unit, crank the handle of the ringing generator.

(*b*) To communicate between the two control units, proceed as follows:

1. At the local control unit, set the LOCAL switch to TEL; at the remote control unit, set the SELECTOR switch to TEL.

2. Remove the CX–7464/U from the local control unit and replace it with the H–33/PT (or equal).

3. Communicate between the two controls units using associated handset.

(3) *Radio communication.* Check to see that the CX–7474/U is connected between the local control unit and the receiver-transmitter (A, fig. 6–10).

(*a*) To communicate on the radio at the local control unit, use the handset connected to the receiver-transmitter.

(*b*) To communicate on the radio from the remote control unit, proceed as follows:

1. At the local control unit, set the REMOTE switch to SET 1.

2. At the remote control unit, set the SELECTOR switch fully counterclockwise ((1) (*e*)*3* above).

3. Operate the H–33/PT at the remote control unit to communicate on the radio using push-to-talk radio operation with the proper call signs and radio procedure.

b. RWI Operation.

(1) *Connections.*

(*a*) Install the batteries in the local and remote control units.

(*b*) Locate the local control unit next to the receiver-transmitter and interconnect the two units with the CX–7474/U (B, fig. 6–10).

(*c*) Locate the remote control unit next to the switchboard, and interconnect the local and remote control units and the switchboard with field wire.

(*d*) Locate a monitor telephone next to the switchboard and connect it to the line binding posts on the switchboard.

(*e*) To check for proper connections of the field wire, perform the following:

1. Turn on the receiver-transmitter. Connect a handset to it; the rushing noise should be heard.

2. At the remote control unit, set the SELECTOR switch fully counterclockwise (for the left-hand write-in position).

3. At the local control unit, set the REMOTE switch to SET 1.

4. At the remote control unit, connect a H–33/PT to the AUDIO connector (B, fig. 6–10); tape the handset push-to-talk switch to that it is always operated.

5. At the switchboard, connect the operator's cord to the radio link jack, and operate the switch on the operator's headset-chestset to the push-to-talk radio position to key the radio. If the radio is not keyed, reverse the connections of the field wire to the switchboard binding posts. Recheck the keying function with the switchboard operator's set.

(*f*) Connect the monitor telephone cord to the radio link jack (D, fig. 6–10); set the telephone for local battery operation, and locate the telephone handset so that the switchboard operator can hear radio calls.

(2) *Operation.* The monitor telephone connected at the switchboard for the radio link will be used by the operator to hear incoming calls requiring RWI.

(*a*) To communicate on the radio from the receiver-transmitter, use the handset connected to the radio.

(*b*) To use the telephone circuit between the local and remote control units, connect a H–33/PT to the local control unit in place of the C–7474/U and use the procedures in *a*(2) above.

(*c*) For the switchboard operator to communicate on the radio, proceed as follows:

1. Connect the operator's cord to the radio link jack.

2. Use the push-to-talk *radio* position of the headset-chestset to key the radio and release the switch to receive the radio communication.

(*d*) When a radio call is heard on the monitor telephone, insert the operator's cord into the monitor telephone jack. When the desired subscriber has been determined, advise the distant radio station to standby while the arrangements in *1* and *2* below are being made:

1. Insert the operator's cord into the subscriber's jack, ring, and advise the subscriber of the radio call, and call signs; request him to ring back when the radio communication is finished.

2. Remove the monitor telephone cord from the radio link jack (D, fig. 6–10) and connect the subscriber's cord to the radio link jack (D, fig. 6–10). Communication between the subscriber and distant radio station proceeds automatically with push-to-talk operation.

(*e*) Remove the operator's cord from the subscriber's jack.

(*f*) When the subscriber rings off, insert the operator's cord into the subscriber's jack and challenge the circuit without operating the headset-chestset switch to push-to-talk *radio* position (this would key the radio).

(*g*) Remove the operator's cord from the subscriber's jack and reconnect the monitor telephone cord to the radio link jack (D, fig. 6–10) to await further radio calls.

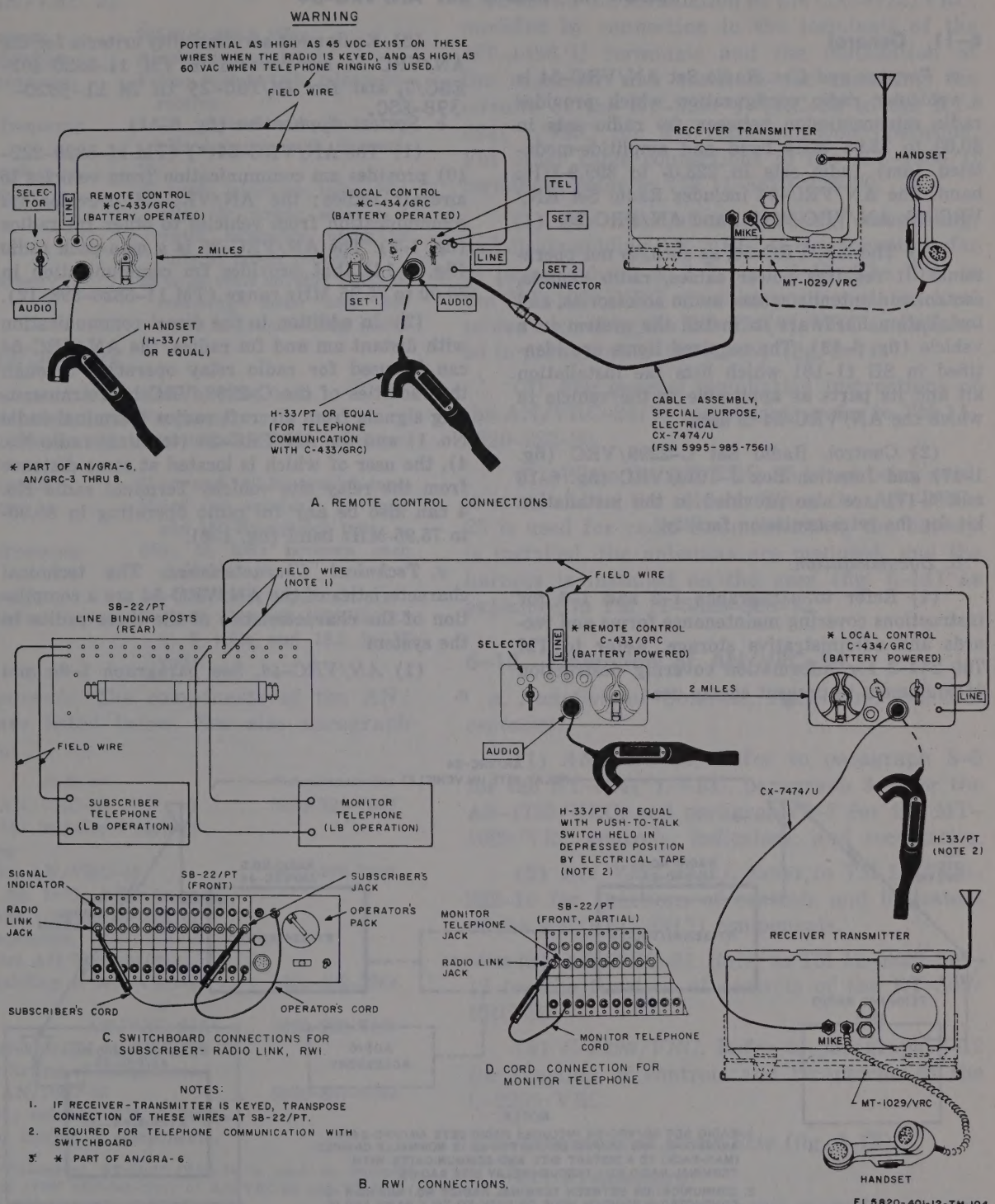


Figure 6-10. Connections for remote control operation and RWI operation of receiver-transmitters using AN/GRA-6.

Section III. RADIO SET AN/VRC-54

6-11. General

a. Purpose and Use. Radio Set AN/VRC-54 is a vehicular radio configuration which provides radio retransmission between fm radio sets in 30.00 to 75.95 MHz band and amplitide-modulated (am) radio sets in 225.0- to 399.9-MHz band. The AN/VRC-54 includes Radio Set AN/VRC-46, AN/VRC-24(*), and AN/PRC-25.

(1) The AN/VRC-54, as such, is not operational. It requires power cables, radio mounts, control and antenna cables, audio accessories, and installation hardware to install the system in a vehicle (fig. 6-13). The required items are identified in SB 11-131 which lists the installation kit and its parts as applicable to the vehicle in which the AN/VRC-54 is used.

(2) Control, Radio Set C-2299/VRC (fig. 1-17) and Junction Box J-1014/VRC (fig. 6-16 and 6-17) are also provided in the installation kit for the retransmission facility.

b. Documentation.

(1) Refer to paragraphs 1-2 and 1-3 for instructions covering maintenance forms and records and administrative storage. Refer to TM 750-244-2 for information covering destruction of equipment to prevent enemy use.

(2) Equipment serviceability criteria for the AN/VRC-54 are covered in TM 11-5820-401-ESC/7, and for AN/PRC-25 in TM 11-5820-398-ESC.

c. System Application (fig. 6-11).

(1) The AN/VRC-24(*) (TM 11-5820-222-10) provides am communication from vehicles to aircraft radios; the AN/VRC-46 provides fm communication from vehicles to other fm radios (fig. 1-2). The AN/PRC-25 is a man-pack radio (fig. 6-14) that provides fm communication in 30.00 to 75.95 MHz range (TM 11-5820-398-12).

(2) In addition to the direct communication with distant am and fm radios, the AN/VRC-54 can be used for radio relay operation through the facilities of the C-2299/VRC by retransmitting signals from aircraft radios (terminal radio No. 1) and the AN/PRC-25 (terminal radio No. 4), the user of which is located at some distance from the relay site vehicle. Terminal radio No. 4 can also be any fm radio operating in 30.00- to 75.95-MHz band (fig. 1-2).

c. Technical Characteristics. The technical characteristics of the AN/VRC-54 are a compilation of the characteristics of the three radios in the system.

(1) *AN/VRC-46.* See paragraph 1-8*a* and *c*.

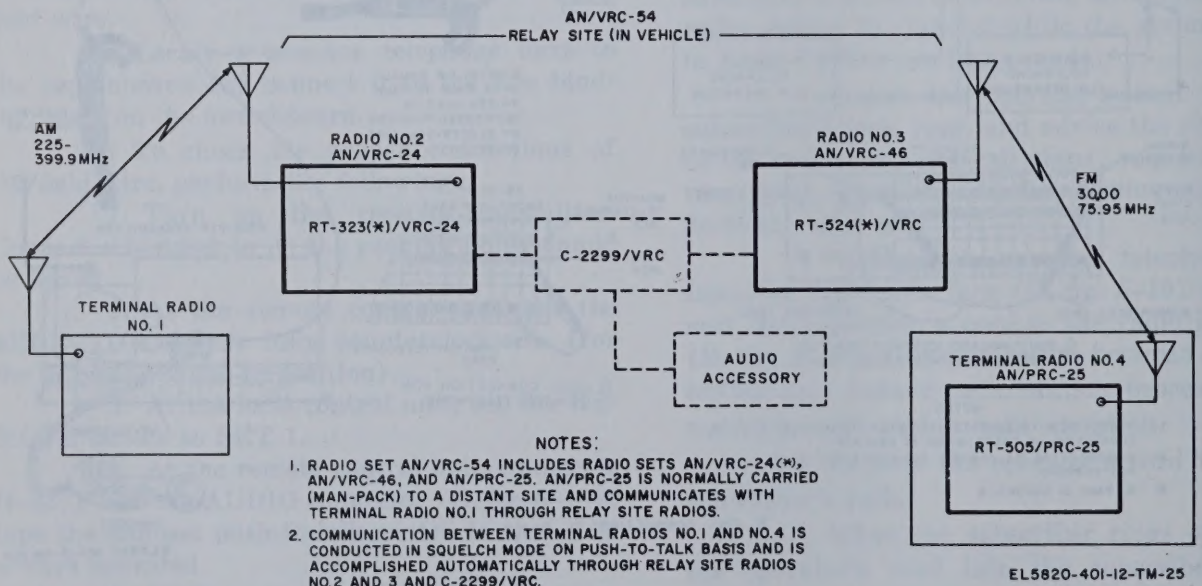


Figure 6-11. Radio Set AN/VRC-54, system application.

(2) *AN/VRC–24.*

Frequency range	225.0 to 399.9 MHz.
Type of modulation	Amplitude-modulated.
Type of transmission	Voice; push-to-talk, release-to-receive.
Number of frequency channels.	1,750; crystal controlled; 100 kHz between each channel.
Preset channels	10.
RF power output	16 watts, minimum, using 26.4 volts dc power source; 4 watts, minimum, using 22 volts dc power source.
Operating power	22 to 28 volts dc; 200 watts in receiving mode and 300 watts in transmitting mode.

(3) *AN/PRC–25.*

Frequency range	30.00 to 75.95 MHz.
Type of modulation	Frequency.
Type of transmission and reception:	Push-to-talk, release-to-receive.
Transmission	Voice and 150-Hz squelch tone.
Reception	Voice (no squelch), or voice and 150-Hz squelch tone.
Number of frequency channels.	950; 50 kHz between each channel.
RF power output	1.1 to 2 watts (approx).
Operating power	Battery, Dry BA–4386/U; 2.5 to 3 volts and 12.5 to 15 volts.

d. Components. The components of the AN/VRC–54 are listed below. See also paragraph *a*(1) above.

Radio set	*Federal stock No.*
Radio Set AN/VRC–54 (fig. 6–13) includes 1 each of following:	5820–223–7567
Radio Set AN/VRC–46 (I, fig. 1–7); refer to paragraph 1–9*a* for listing of components.	5820–223–7433
Radio Set AN/VRC–24(*) consisting of AN/VRC–24[a]	5820–402–2264
or AN/VRC–24A[a] (Refer to TM 11–5820–222–10 for listing of components.)	5820–223–7413
Radio Set AN/PRC–25 (fig. 6–14); refer to TM 11–5820–398–12 for listing of components.	5820–857–0759

[a] Receiver-Transmitter RT–323(*)/VRC–24 is used to represent RT–323/VRC–24 (FSN 5820–543–1978) of AN/VRC–24 and RT–323A/VRC–24 (FSN 5820–892–3727) of AN/VRC–24A.

6–12. Installation of AN/VRC–54

The AN/VRC–54 is installed using the equipment provided in the installation kit(s) applicable to the vehicle in which the radio set is used (para 6–11*a*(1)). The installation kit includes the installation instructions. Figure 6–13 shows typical cabling of the radio equipment. Figure 6–12 shows the installation of the CX–4723/VRC, modified by connection to the terminals of the MT–1436/U terminals and the installation of the capacitor and resistors for matching the circuits of the RT–323(*)/VRC–24 to the RT–524(*)/VRC for the retransmission operation. For other cable connections to the MT–1436/U terminals, refer to TM 11–5820–222–20.

(1) For installation, handling, assembling, and disassembling AN/VRC–46 components, refer to paragraphs 2–6, 2–7, and 2–10. The link in the MT–1029/VRC must be positioned for local power control by the RT–524(*)/VRC as explained in paragraph 2–10*b*(1)(*b*) (fig. 2–11).

(2) For general installation instructions of the AN/VRC–24(*) components, refer to TM 11–5820–222–20.

(3) When the AN/PRC–25 is not being used, it is stowed in the vehicle. When the AN/PRC–25 is used for radio communication, the battery is installed, the antennas are mounted, and the harness is installed on the user (fig. 6–14) as explained in TM 11–5820–398–12.

6–13. Operation of AN/VRC–54

a. Function of Controls, Indicators, and Receptacles.

(1) *AN/VRC–46.* Refer to paragraph 3–3 for the RT–524(*)/VRC, paragraph 3–5 for the AS–1729/VRC, and paragraph 3–7 for the MT–1029/VRC controls, indicators, and receptacles.

(2) *AN/VRC–24(*).* Refer to TM 11–5820–222–10 for functions of controls and indicators of the AN/VRC–24(*) components.

(3) *AN/PRC–25.* Refer to TM 11–5820–398–12 for the function of controls of the RT–505/PRC–25.

(4) *C–2299/VRC.* Refer to paragraph 3–12 for function of controls and receptacles of the C–2299/VRC.

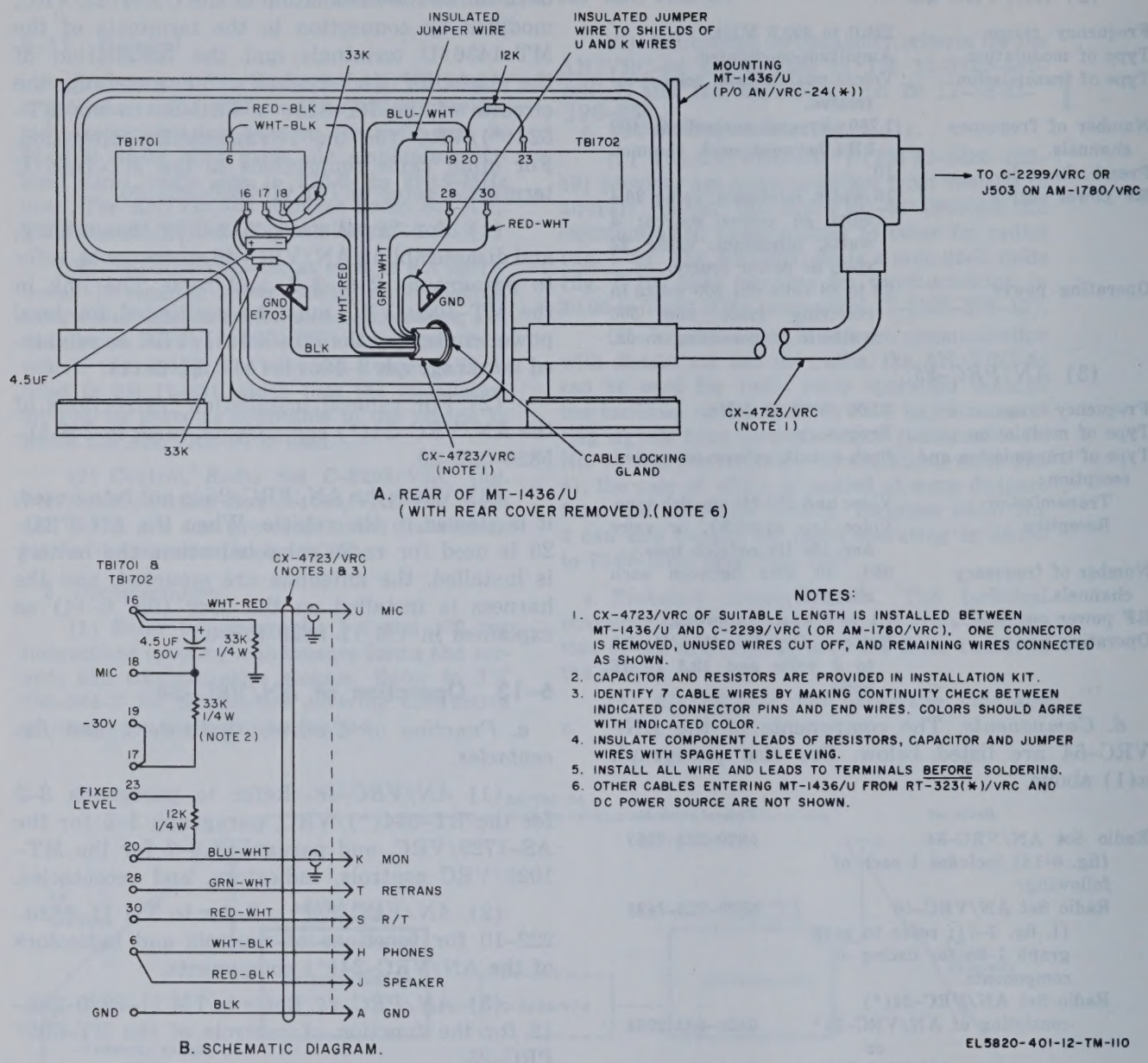
b. Operation of Radio Sets (fig. 6–13).

(1) *Preliminary.*

(*a*) Review the general operating instructions given in paragraph 3–14. Refer to paragraph 3–15 for instructions on the use of audio accessories used with the RT–524(*)/VRC.

(*b*) When the radio sets are not being used for retransmission operation ((5) below), set the C–2299/VRC RETRANS switch to OFF.

(*c*) If required, turn on the master switch of the vehicle to apply power to the radios.



NOTES:

1. CX-4723/VRC OF SUITABLE LENGTH IS INSTALLED BETWEEN MT-1436/U AND C-2299/VRC (OR AM-1780/VRC), ONE CONNECTOR IS REMOVED, UNUSED WIRES CUT OFF, AND REMAINING WIRES CONNECTED AS SHOWN.
2. CAPACITOR AND RESISTORS ARE PROVIDED IN INSTALLATION KIT.
3. IDENTIFY 7 CABLE WIRES BY MAKING CONTINUITY CHECK BETWEEN INDICATED CONNECTOR PINS AND END WIRES. COLORS SHOULD AGREE WITH INDICATED COLOR.
4. INSULATE COMPONENT LEADS OF RESISTORS, CAPACITOR AND JUMPER WIRES WITH SPAGHETTI SLEEVING.
5. INSTALL ALL WIRE AND LEADS TO TERMINALS BEFORE SOLDERING.
6. OTHER CABLES ENTERING MT-1436/U FROM RT-323(*)/VRC AND DC POWER SOURCE ARE NOT SHOWN.

EL5820-401-12-TM-110

Figure 6-12. Details for installing cable and parts in MT-1436/U of AN/VRC-24(*) in AN/VRC-54 installations.

(*d*) After the radios are turned on and tuned to the operating frequencies, they are ready for radio communication, controlled by the operator using audio accessories.

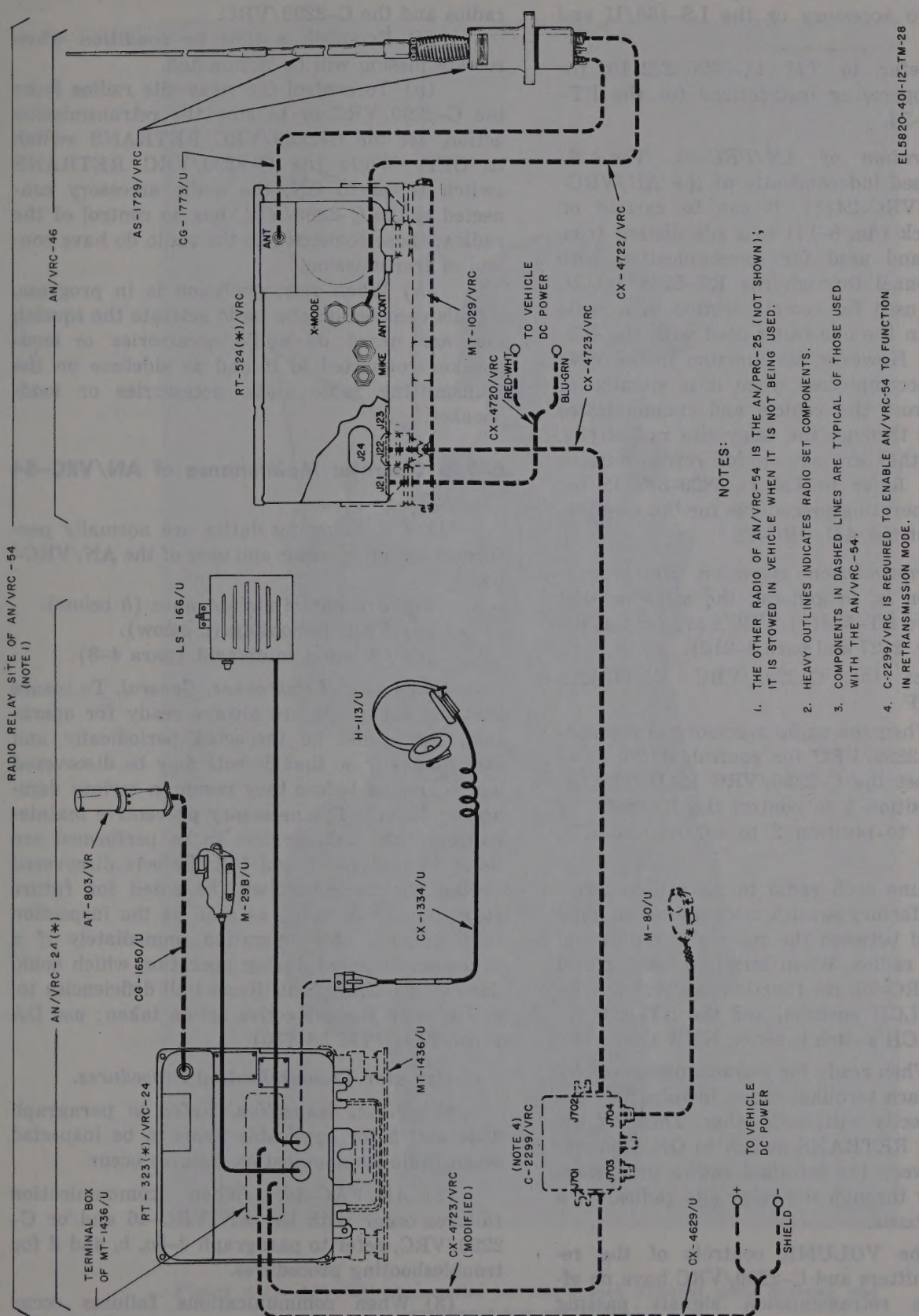
(2) *Operation of RT-524(*)/VRC.*

(*a*) Connect the audio accessory either to the MIKE receptacles on the RT-524(*)/VRC or to the C-2299/VRC. When connected to the C-2299/VRC, set the C-2299/VRC RAD TRANS switch (fig. 3-9) to position 2 to control the RT-524(*)/VRC. (Position 1 controls the RT-323(*)/VRC-24 when the control cable is connected between C-2299/VRC J701 and the RT-323(*)/VRC-24 (fig. 6-13).)

(*b*) Refer to paragraph 3-17 for tuning and operating procedures for the RT-524(*)/VRC.

(3) *Operation of RT-323(*)/VRC-24.*

(*a*) Connect the audio accessories to the RT-323(*)/VRC-24. To control the RT-323(*)/VRC from an audio accessory connected to the C-2299/VRC, set the C-2299/VRC RAD TRANS



NOTES:

1. THE OTHER RADIO OF AN/VRC-54 IS THE AN/PRC-25 (NOT SHOWN); IT IS STOWED IN VEHICLE WHEN IT IS NOT BEING USED.
2. HEAVY OUTLINES INDICATES RADIO SET COMPONENTS.
3. COMPONENTS IN DASHED LINES ARE TYPICAL OF THOSE USED WITH THE AN/VRC-54.
4. C-2299/VRC IS REQUIRED TO ENABLE AN/VRC-54 TO FUNCTION IN RETRANSMISSION MODE.

EL5820-401-12-TM-28

Figure 6-15. Typical cabling details of AN/VRC-24(*) and AN/VRC-46 in AN/VRC-54 installations.

switch to position 1. Radio reception can be heard on that audio accessory or the LS-166/U and H-113/U.

(*b*) Refer to TM 11-5820-222-10 for tuning and operating instructions for the RT-323(*)/VRC-24.

(4) *Operation of AN/PRC-25.* The AN/PRC-25 is used independently of the AN/VRC-46 and AN/VRC-24(*). It can be carried on the user's back (fig. 6-14) to a site distant from the vehicle and used for communication with vehicle personnel through the RT-524(*)/VRC or it can be used for communication in a radio net other than the one being used with the RT-524(*)/VRC. However, its function in the AN/VRC-54 is accomplished when it is situated at a distance from the vehicle and communicates with aircraft through the relay site radios (fig. 6-11) when they are set up for retransmission ((5) below). Refer to TM 11-5820-398-12 for tuning and operating procedures for the receiver-transmitter of the AN/PRC-25.

(5) *Retransmission operation.* Retransmission operation is, in general, the same as that used when two RT-524(*)/VRC's are used at the relay site (fig. 2-27 and para 3-21*d*).

(*a*) Set the C-2299/VRC RETRANS switch to OFF.

(*b*) When the audio accessory is connected to the C-2299/VRC for control of the relay site radios, set the C-2299/VRC RAD TRANS switch to position 1 to control the RT-323(*)/VRC-24 and to position 2 to control the RT-524(*)/VRC.

(*c*) Tune each radio to its assigned frequency. Satisfactory squelch mode operation must be established between the relay site radios and the terminal radios. When terminal radio No. 4 is the AN/PRC-25, its function switch must be set to SQUELCH position, and the RT-524(*)/VRC SQUELCH switch is set on NEW ON.

(*d*) When ready for retransmission operation, notify each terminal radio, in turn, to communicate directly with each other. Then set the C-2299/VRC RETRANS switch to ON. Communication between the terminal radios progresses automatically through the relay site radios, on a push-to-talk basis.

(*e*) The VOLUME controls of the receiver-transmitters and C-2299/VRC have no effect on the retransmission signals passing through them. However, the VOLUME controls do have control of the received signals applied to the audio accessories connected directly to the radios and the C-2299/VRC.

(*f*) Establish a time or condition when retransmission will be terminated.

(*g*) To control the relay site radios from the C-2299/VRC or to stop the retransmission action, set the C-2299/VRC RETRANS switch to OFF. While the C-2299/VRC RETRANS switch is set to ON, the audio accessory connected to the C-2299/VRC has no control of the radios; those connected to the radio do have control of transmission.

(*h*) When retransmission is in progress, signals received on one radio activate the squelch and are heard on audio accessories or loudspeaker connected to it and as sidetone on the transmitting radio audio accessories or loudspeaker.

6-14. Operator Maintenance of AN/VRC-54

a. Scope.

(1) The following duties are normally performed by the operator and user of the AN/VRC-54.

(*a*) Preventive maintenance (*b* below).
(*b*) Troubleshooting (*c* below).
(*c*) Cleaning equipment (para 4-3).

b. Preventive Maintenance, General. To insure that the radio sets are always ready for operation, they must be inspected periodically and systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed in tables 6-1 and 6-2. Defects discovered during the inspection will be noted for future correction to be made as soon as the inspection is completed. Stop operation immediately if a deficiency is noted during operation which could damage the equipment. Record all deficiencies together with the corrective action taken; use DA Form 2404 (TM 38-750).

c. Operator Troubleshooting Procedures.

(1) *Visual inspection.* Refer to paragraph 4-4*a* and *b* for applicable items to be inspected when radio communication failures occur.

(2) *AN/VRC-46.* When communication failures occur with the AN/VRC-46 and/or C-2299/VRC, refer to paragraph 4-5*a*, *b*, and *d* for troubleshooting procedures.

(3) When communications failures occur with the AN/VRC-24(*), refer to TM 11-5820-222-10 for troubleshooting procedures.

Figure 6-14. AN/PRC-25 installed on user's back (10-foot whip antenna and equipment bag not shown).

Table 6-1. Operator Preventive Maintenance Checks and Services—Daily Schedule

Item No.	Item to be inspected	Procedure	References
		If equipment is not used daily, the checks and services will be performed weekly.	
1	AN/VRC-46 AND C-2299/VRC	Perform checks and services applicable to equipment specified in following items of table 4-1:	Table 4-1.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 3.	
1*c*		*c.* Item 4.	
1*d*		*d.* Item 5.	
2	AN/VRC-24(*)	Perform checks and services specified for operator.	TM 11-5820-222-10.
3	AN/PRC-25	Perform checks and services specified for operator.	TM 11-5820-398-12.

Table 6-2. Operator Preventive Maintenance Checks and Services—Weekly Schedule

Item No.	Item to be inspected	Procedure	References
1	AN/VRC-46 and C-2299/VRC	Perform checks and services applicable to equipment specified in following items of table 4-2:	Table 4-2.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 2.	
1*c*		*c.* Item 4 (MT-1029/VRC; fig. 2-7).	
1*d*		*d.* Item 5.	
1*e*		*e.* Item 6.	
1*f*		*f.* Item 7.	
1*g*		*g.* Item 8.	
1*h*		*h.* Item 9.	
2	AN/PRC-25	Perform checks and services specified for operator.	TM 11-5820-398-12.

Table 6-3. Organizational Preventive Maintenance Checks and Services—Monthly Schedule

Item No.	Item to be inspected	Procedure	References
1	AN/VRC-24(*)	Perform checks and services applicable to the equipment.	TM 11-5820-222-20.

Table 6-4. Organizational Preventive Maintenance Checks and Services—Quarterly Schedule

Item No.	Item to be inspected	Procedure	References
1	AN/VRC-46 AND C-2299/VRC	Perform checks and services applicable to equipment specified in following items of table 5-1:	Table 5-1.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 2.	
1*c*		*c.* Item 3.	
1*d*		*d.* Item 5.	
1*e*		*e.* Item 6.	
1*f*		*f.* Item 8 (MT-1029/VRC).	
1*g*		*g.* Item 10.	
1*h*		*h.* Item 12.	
2	AN/VRC-24(*)	Perform checks and services specified for organizational maintenance.	TM 11-5820-222-20.
3	AN/PRC-25	Perform checks and services specified for organizational maintenance.	TM 11-5820-398-12.

(4) When communications failures occur with the AN/PRC-25, refer to TM 11-5820-298-12 for troubleshooting procedures.

6-15. Organizational Maintenance of AN/VRC-54

a. The following duties are normally performed by the organizational repairman and user of the AN/VRC-54.

(1) Preventive maintenance (*b* below).

(2) Lubricating parts (para 5-3).

(3) Touchup painting (para 5-4).

(4) Cleaning heat exchanger of AN/VRC-46 (para 5-5).

(5) Troubleshooting and repair (*c* below).

b. Preventive Maintenance. Apply the instructions given in paragraph 6-14*b*, except use tables 6-3 and 6-4.

c. Organizational Troubleshooting and Repairs.

(1) *AN/VRC-46.*

(*a*) When communication failures occur with the AN/VRC-46, refer to paragraph 5-9*a*, *b*, and *e* for system troubleshooting procedures.

(*b*) Refer to paragraphs 5-12 and 5-13 for repair procedures.

(2) *AN/VRC-24*(*). For troubleshooting and repair procedures for the AN/VRC-24(*), refer to TM 11-5820-222-20.

(3) *AN/PRC-25.* For troubleshooting and repair procedures for the AN/PRC-25, refer to TM 11-5820-398-12.

(4) *AN/VRC-54.* Refer to figure FO-9 for the circuits of the radios and C-2299/VRC involved in the retransmission of signals between the radios.

Section IV. RADIO SET AN/VRC-55

6-16. General

a. Purpose and Use. Radio Set AN/VRC-55 is a vehicular radio configuration which provides radio retransmission between fm radio sets in 30.00- to 75.95-MHz band and am radio sets in 1.5- to 20.00-MHz band.

(1) The AN/VRC-55 (fig. 6-17) includes Radio Sets AN/VRC-46 and AN/GRC-19. It also includes long range antennas: Antenna Equipment RC-292 (para 6-6) for use with the AN/VRC-46; and Accessory Kit MX-1137/GRA-12 (TM 11-2651) for use with the AN/GRC-19.

(2) The AN/VRC-55 as such is not operational; It requires power cables, radio mounts, control and antenna cables, audio accessories, and installation hardware. Also required are Junction Box J-1014/VRC and Control, Radio Set C-2299/VRC for the retransmission operation. These required items are identified in SB 11-131 which lists the installation kit and the items applicable to the vehicle in which the AN/VRC-55 is used.

b. Documentation.

(1) Refer to paragraphs 1-2 and 1-3 for instructions covering maintenance forms and records and administrative storage. Refer to TM 750-244-2 for information covering destruction of equipment to prevent enemy use.

(2) Equipment serviceability criteria are the AN/VRC-46 are provided in TM 11-5820-401-ESC/2.

c. System Application (fig. 6-15).

(1) The AN/GRC-19 (TM 11-5820-295-10) provides communication from vehicles to other am radios; the AN/VRC-46 provides communication from vehicles to other fm radios (fig. 1-2).

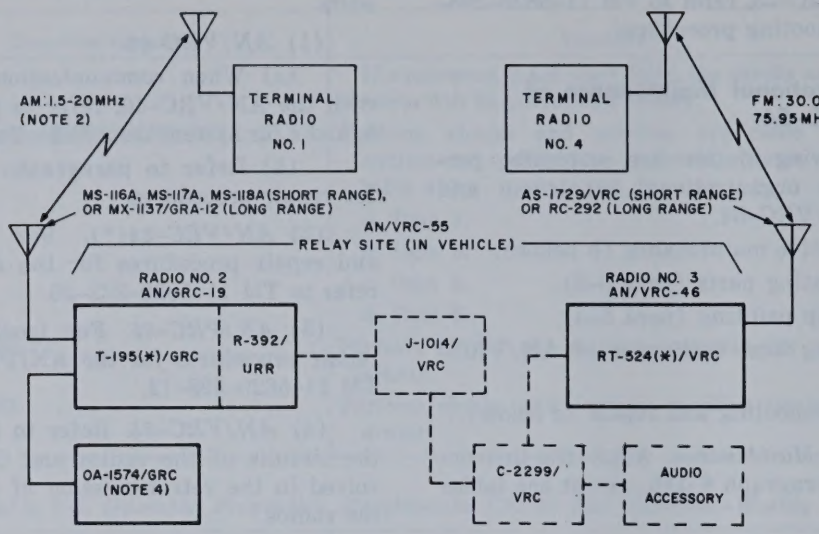
(2) In addition to direct communication with distant am and fm radios, the AN/VRC-55 can be used for radio relay operation through the facilities of the C-2299/VRC and J-1014/VRC by retransmitting signals between am radios (terminal radio Mo. 1) and fm radios (terminal radio No. 4) (fig. 1-2).

c. Technical Characteristics. The technical characteristics of the AN/VRC-55 are a compilation of the characteristics of the two radios in the system.

(1) *AN/VRC-46.* See paragraph 1-8*a* and *c*.

(2) *AN/GRC-19.*

Frequency range:	
T-195(*)/GRC-19	1.5 to 20 MHz.
R-392/URR	0.5 to 32 MHz.
Types of modulation	Am and cw.
Preset channels	8.
RF power output:	
15-foot whip antenna.	1.5 to 2 MHz: 13 watts.



NOTES:

1. RADIO SET AN/VRC-55 INCLUDES AN/GRC-19, AN/VRC-46, MX-1137/GRC-12 (FOR LONG RANGE), AND RC-292 (FOR LONG RANGE).
2. IN AN/GRC-19, THE RECEIVER R-392/URR FUNCTIONS BETWEEN 0.5 AND 32MHz; THE TRANSMITTER T-195(*)/GRC FUNCTIONS BETWEEN 1.5 AND 20MHz.
3. COMMUNICATIONS BETWEEN TERMINAL RADIOS NO. 1 AND NO. 4 IS CONDUCTED IN SQUELCH MODE ON PUSH-TO-TALK BASIS AND IS ACCOMPLISHED AUTOMATICALLY THROUGH RELAY SITE RADIOS, AND C-2299/VRC AND J-1014/VRC WHICH ARE NOT PART OF AN/VRC-55.
4. OA-1574/GRC, PART OF AN/GRC-19, (CW AND FSK REMOTE CONTROL), IS NOT USED IN RETRANSMISSION OPERATION.

EL5820-401-12-TM-26

Figure 6-15. Radio Set AN/VRC-55, system application.

	2 to 3 MHz: 28 watts.
	3 to 4 MHz: 45 watts.
	4 to 5 MHz: 60 watts.
	6 to 9 MHz: 100 watts.
	9 to 16 MHz: 90 watts.
	16 to 20 MHz: 80 watts.
MX-1137/GRA-12	15 to 12 MHz: 100 watts.
	12 to 16 MHz: 90 watts.
	16 to 20 MHz: 80 watts.
Communication range	50 miles (80 km) (approx).
Operating power:	
Starting	7,125 watts at 28.5 volts dc.
Operating (transmitting).	1,276 watts at 28.5 volts dc.
Standby (receiving)	265.5 watts at 28.5 volts dc.

(3) *RC-292.*

Type	Omnidirectional vertical whip antenna with 30-degree ground plane.
Frequency range	20 to 76 MHz.
Distance range (for AN/VRC-46):	
Between RC-292 and AS-1729/VRC.	30 miles (48 km) (approx).
Between RC-292's	36 miles (60 km) (approx).
Between RC-292 and man-pack radios (such as AN/PRC-25, AN/PRC-77).	8 miles (13 km) (approx) (limit of AN/PRC-25 and AN/PRC-77).
Input impedance	50 ohms.
Erected height	31 foot mast; plus antenna elements of 6, 9, or 12 feet.

(4) *MX-1137/GRA-12.*

Type	Center-fed Hertz (half-wave).
Frequency range	1.5 to 20 MHz.
Input impedance	50 ohms.
Power capability	Up to 500 watts RF power.

d. Components. The components of the AN/VRC-55 are listed below. See also *a*(1) above.

Radio set	*Federal stock No.*
Radio Set AN/VRC-54 (fig. 6-17) includes 1 each of the following:	5820-402-2265
Radio Set AN/GRC-19; Refer to TM 11-5820-295-10 for listing of components.	5820-223-7409

Radio set	*Federal stock No.*
Radio Set AN/VRC-46 (I, fig. 1-7); refer to paragraph 1-9*a* for listing of components.	5820-223-7433
Accessory Kit MX-1137/GRA-12 (fig. 6-17); refer to TM 11-2651 for listing of components.	5820-378-4718
Antenna Equipment RC-292 (fig. 6-17); refer to TM 11-5820-348-15 for listing of components.	5820-497-8554

6-17. Installation of AN/VRC-55

The AN/VRC-55 is installed using the equipment provided in the installation kits applicable to the vehicle in which the radio is used (para 6-16*a* (2)). The installation kit includes the installation instructions. Figure 6-16 shows the assemblage of the junction box J-1014/VRC modified by the use of the CX-4723/VRC. Figure 6-17 shows typical cabling of the radio equipment.

(1) For installation, handling, assembling, and disassembling AN/VRC-46 components, refer to paragraphs 2-6, 2-7, and 2-10. The link in the MT-1029/VRC must be set for local power control by the RT-524(*)/VRC as explained in paragraph 2-10*b*(1)(*b*) (fig. 2-11).

(2) For general installation instructions for the AN/GRC-19 components, refer to TM 11-5820-295-10 and TM 11-5820-295-35.

(3) When the RC-292 is used for long-range communication with the RT-524(*)/VRC, refer to TM 11-5820-348-15 for installation instructions. Use the prescribed number of antenna elements and ground plane sections according to the frequency being used on the RT-524(*)/VRC.

(4) When the MX-1137/GRA-12 is used for long-range communication with the AN/GRC-19, refer to TM 11-2651 for installation instructions.

6-18. Operation of AN/VRC-55

a. Function of Controls, Indicators, and Receptacles.

(1) *AN/VRC-46.* Refer to paragraph 3-3 for the RT-524(*)/VRC, paragraph 3-5 for the AS-1729/VRC, paragraph 3-7 for the MT-1029/VRC, and paragraph 3-21 for the C-2299/VRC for the function of controls, indicators, and receptacles.

(2) *AN/GRC-19.* Refer to TM 11-5820-295-10 for the function of controls and indicators of the AN/GRC-19 components.

b. Operation of Radio Sets (fig. 6-17).

(1) *Preliminary.*

(*a*) Review the general operating instructions given in paragraph 3-14. Refer to paragraph 3-15 for instructions on the use of audio accessories used with the RT-524(*)/VRC.

(*b*) When the radio sets are not being used for retransmission operation ((4) below), set the RETRANS switch of the C-2299/VRC to OFF.

(*c*) If required, turn on the master switch of the vehicle to apply power to the radios.

(*d*) After the radios are turned on and tuned to the assigned operating frequencies, they are ready for radio communication controlled by the operator using audio accessories.

(2) *Operation of RT-524(*)/VRC.*

(*a*) Connect the audio accessory to the MIKE receptacle of the RT-524(*)/VRC or to the C-2299/VRC. When connected to the C-2299/VRC, set the C-2299/VRC RAD TRANS switch (fig. 3-9) to position 2. (Position 1 controls the AN/GRC-19's T-195(*)/GRC-19 and R-392/URR.

(*b*) Refer to paragraph 3-17 for tuning and operating instructions for the RT-524(*)/VRC.

(3) *Operation of the AN/GRC-19.*

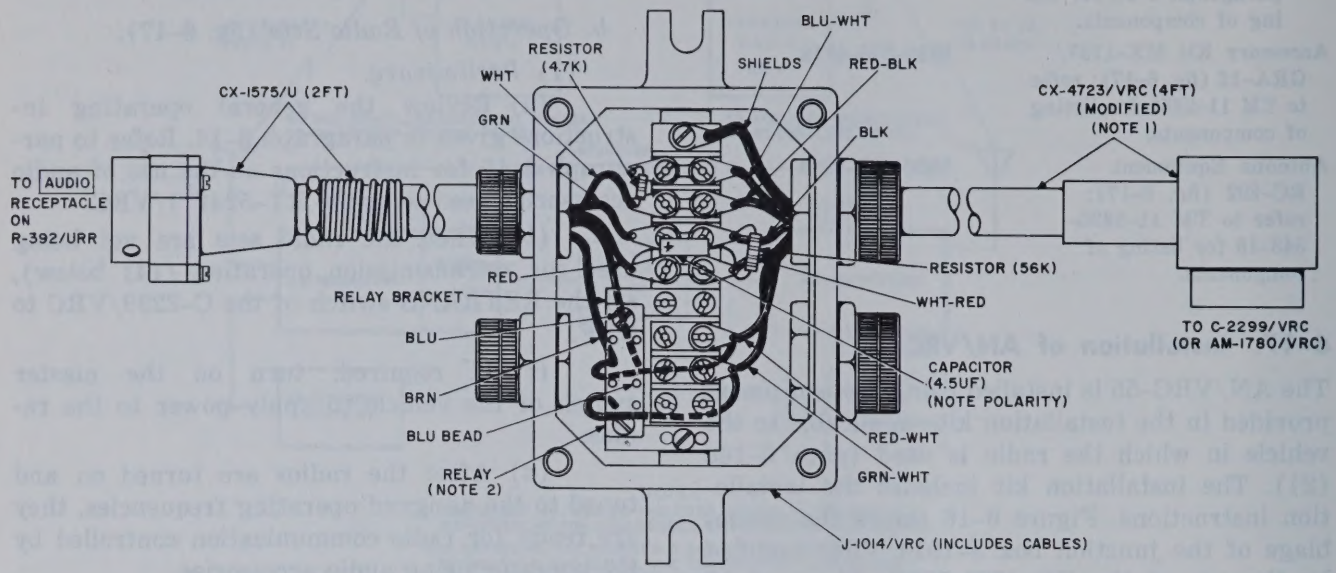
(*a*) Connect the audio accessory or K-116/U to the AN/GRC-19. To control the AN/GRC-19 from the audio accessory connected to the C-2299/VRC, set the C-2299/VRC RAD TRANS switch to position 1. Radio reception can be heard on the LS-166/U or H-113/U, or on the audio accessory connected to the C-2299/VRC.

(*b*) Refer to TM 11-5820-295-10 for tuning and operating procedures for the AN/GRC-19.

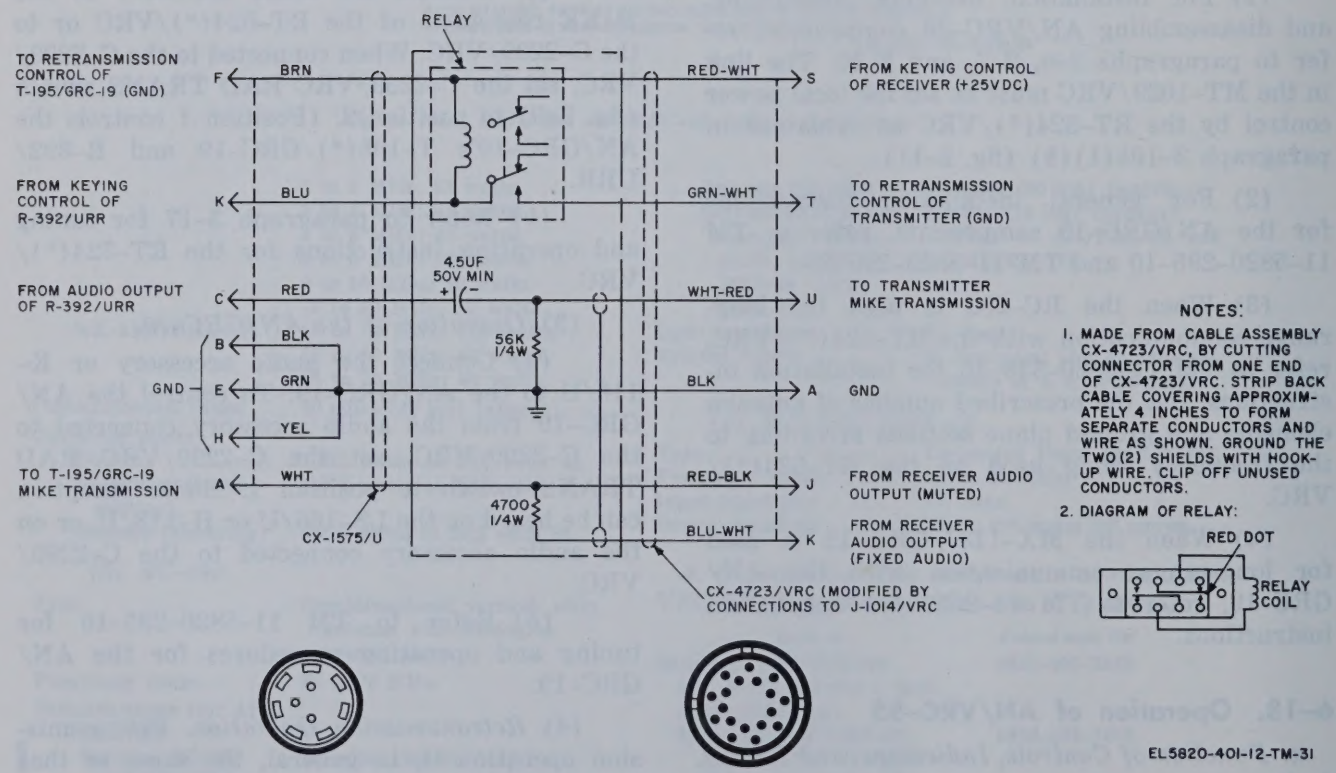
(4) *Retransmission Operation.* Retransmission operation is, in general, the same as that used when two RT-524(*)/VRC's are used at the relay site (fig. 2-27 and para 3-21*d*).

(*a*) Set the C-2299/VRC RETRANS switch to OFF.

(*b*) When the audio accessory is connected to the C-2299/VRC for control of the relay site radios, set the RAD TRANS switch to posi-



A. ASSEMBLY-WIRING OF J-1014/VRC.



B. SCHEMATIC-WIRING DIAGRAM OF J-1014/VRC.

Figure 6-16. Details of Junction Box J-1014/VRC modified by use of cable assembly CX-4723/VRC.

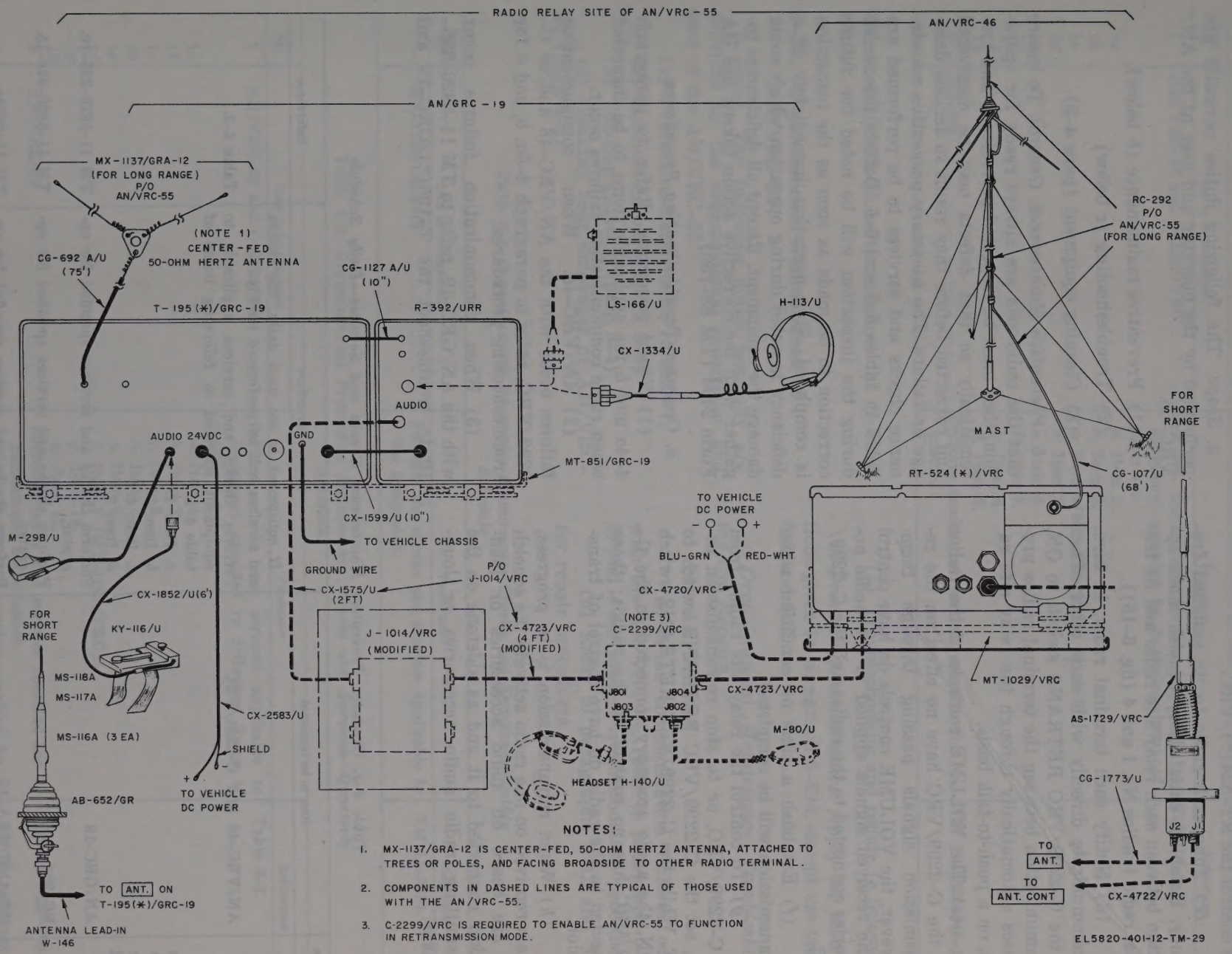


Figure 6–17. Typical cabling details of AN/GRC–19 and AN/VRC–46 in AN/VRC–54 installations.

tion 1 to control the AN/GRC–19 and to position 2 to control the RT–524(*)/VRC.

(*c*) Tune each radio to its assigned frequency. Establish satisfactory squelch mode operation between each relay site radio and its terminal radio (radios No. 1 and 4 (fig. 6–15)).

(*d*) Notify each terminal radio, in turn, to communicate directly with each other. Then set the C–2299/VRC RETRANS switch to ON. Communication between the terminal radios progresses automatically through the relay site radios, on a push-to-talk basis.

(*e*) The VOLUME controls of the radios and the C–2299/VRC have no effect on the retransmission signals passing through them. However, the VOLUME controls do have control of the received signals applied to the audio accessories connected to the radios and the C–2299/VRC.

(*f*) Establish a time or condition when retransmission will be completed.

(*g*) To control the relay site radios from the C–2299/VRC, or to stop retransmission action, set the C–2299/VRC RETRANS switch to OFF. While the C–2299/VRC RETRANS switch is ON, the audio accessory connected to the C–2299/VRC has no control of the radios; those connected to the radio do have control of transmission.

(*h*) When retransmission is in progress, signals received on one radio activate the squelch and are heard on audio accessories or loudspeaker connected to it and as sidetone on the transmitting radio audio accessories or loudspeaker.

6–19. Operator Maintenance of AN/VRC–55

a. Scope. The following duties normally are performed by the operator and user of the AN/VRC–55.

(1) Preventive maintenance (*b* below).

(2) Troubleshooting (*c* below).

(3) Cleaning equipment (para 4–3).

b. Preventive Maintenance, General. To insure that the radio sets are always ready for operation, they must be inspected periodically and systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed in tables 6–5 and 6–6. Defects discovered during the inspection will be noted for future correction to be made as soon as the inspection is completed. Stop operation immediately if a deficiency is noted during operation which could damage the equipment. Record all deficiencies together with the corrective action taken; use DA Form 2404 (TM 38–750).

c. Operator Troubleshooting Procedures.

(1) *Visual inspection.* Refer to paragraph 4–4*a* and *b* for applicable items to be inspected when radio communication failures occur.

(2) *AN/VRC–46.* When communication failures occur with the AN/VRC–46 and/or C–2299/VRC, refer to paragraph 4–5*a, b,* and *d* for troubleshooting procedures.

(3) When communication failures occur with the AN/GRC–19, refer to TM 11–5820–335–10 to troubleshoot the T–195(*)/GRC–19 and

Table 6–5. Operator Preventive Maintenance Checks and Services—Daily Schedule

Item No.	Item to be inspected	Procedure	References
		If equipment is not used daily, the checks and services will be performed weekly.	
1	AN/VRC–46 and C–2291/VRC	Perform checks and services applicable to equipment specified in following items of table 4–1.	Table 4–1.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 3.	
1*c*		*c.* Item 4.	
1*d*		*d.* Item 5.	
2	AN/GRC–19	Perform checks and services specified for operator.	TM 11–5820–295–10.
3	RC–292	Perform checks and services specified for operator.	TM 11–5820–348–15.
4	MX–1137/GRA–12	Perform checks and services specified for operator.	TM 11–2651.

Table 6-6. Operator Preventive Maintenance Checks and Services—Weekly Schedule

Item No.	Item to be inspected	Procedure	References
1	AN/VRC-46 and C-2299/VRC	Perform checks and services applicable to equipment specified in following items of table 4-2.	Table 4-2.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 2.	
1*c*		*c.* Item 4(MT-1029/VRC; fig. 2-7).	
1*d*		*d.* Item 5.	
1*e*		*e.* Item 6.	
1*f*		*f.* Item 7.	
1*g*		*g.* Item 8.	
1*h*		*h.* Item 9.	
2	RC-292	Perform checks and services specified for operator.	TM 11-5820-348-15.

TM 11-5820-334-10 to troubleshoot the R-392/URR.

6-20. Organizational Maintenance of AN/VRC-55

a. Scope. The following duties normally are provided by the organizational repairman and user of the AN/VRC-55.

(1) Preventive maintenance (*b* below).

(2) Lubricating parts (para 5-3).

(3) Touchup painting (para 5-4).

(4) Cleaning heat exchanger of AN/VRC-46 (para 5-5).

(5) Troubleshooting and repair (*c* below).

b. Preventive Maintenance. Apply the instructions given in paragraph 6-19*b*, except use tables 6-7 and 6-8.

c. Organizational Maintenance Troubleshooting and Repairs.

(1) *AN/VRC-46.*

(*a*) When communication failures occur with the AN/VRC-46, refer to paragraph 5-9*a*, *b*, and *e* for system troubleshooting procedures.

(*b*) Refer to paragraphs 5-12 and 5-13 for repair procedures.

Table 6-7. Organizational Preventive Maintenance Checks and Services—Monthly Schedule

Item No.	Item to be inspected	Procedure	References
	MX-1137/GRA-12	Perform the checks and services applicable to the equipment.	TM 11-2651.

Table 6-8. Organizational Preventive Maintenance Checks and Services—Quarterly Schedule

Item No.	Item to be inspected	Procedure	References
1	AN/VRC-46 and C-2299/VRC	Perform checks and services applicable to equipment specified in following items of table 5-1:	Table 5-1.
1*a*		*a.* Item 1.	
1*b*		*b.* Item 2.	
1*c*		*c.* Item 3.	
1*d*		*d.* Item 5.	
1*e*		*e.* Item 6.	
1*f*		*f.* Item 8 (MT-1029/VRC).	
1*g*		*g.* Item 10.	
1*h*		*h.* Item 12.	
2	AN/GRC-19	Perform checks and services specified for organizational maintenance.	TM 11-5820-295-20.
3	RC-292	Perform checks and services specified for organizational maintenance.	TM 11-5820-348-15.

(2) *AN/GRC-19.* For troubleshooting and repair procedures for the AN/GRC-19, refer to TM 11-5820-335-20 for the T-195(*)/GRC-19 and TM 11-5820-334-20 for the R-392/URR. For repair procedures for the RC-292, refer to TM 11-5820-348-15; and for the MX-1137/GRA-12, refer to TM 11-2651.

APPENDIX A

REFERENCES

The following is a list of applicable references that are available to the operator and organizational repairman of AN/VRC-12-series radios, and Radio Sets AN/VRC-54 and AN/VRC-55.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9) Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	Modification Work Orders.
SB 11-131	Vehicular radio sets and authorized installations.
SB 11-573	Painting and preservation supplies available for field use for electronics command equipment.
SB 11-586	Blower cover FSN 5820-K98-4055 for mounting MT-1029/VRC
SB 11-624	Warning notice for vehicles in which radios are mounted.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 11-284	Radio sets AN/GRC-3, -4, -5, -6, -7, and -8.
TM 11-285	Radio set AN/VRC-7
TM 11-286	Radio sets: AN/VRC-8, AN/VRC-9, and AN/VRC-10.
TM 11-287	Radio sets AN/VRQ-1, AN/VRQ-2, and AN/VRQ-3.
TM 11-290	Field maintenance: Receiver-transmitters RT-70/GRC, RT-70A/GRC, and radio receiver-transmitter RT-70B/GRC.
TM 11-291	Radio sets AN/VRC-13, AN/VRC-14, and AN/VRC-15.
TM 11-296	Operator and organizational maintenance including repair parts and special tools list: Radio set AN/PRC-6.
TM 11-611	Radio sets AN/VRC-16, AN/VRC-17 and AN/VRC-18.
TM 11-614	Radio set AN/GRC-10; radio terminal set AN/GRC-39; radio repeater set AN/GRC-40.
TM 11-642	Radio sets AN/VRC-20, AN/VRC-21, and AN/VRC-22.
TM 11-2651	Antenna groups AN/GRA-4 and AN/GRC-12.
TM 11-5135-15	Radio set control AN/GSA-7.
TM 11-5805-262-12	Operator's and organizational maintenance manual: Switchboards, telephone, manual SB-22/PT and SB-22A/PT.
TM 11-5820-222-10	Operator's manual: Radio sets AN/VRC-24, AN/VRC-24A, AN/TRC-68, and AN/TRC-68A.
TM 11-5820-222-20	Organizational maintenance manual: Radio sets AN/VRC-24, AN/VRC-24A, AN/TRC-68, and AN/TRC-68A.
TM 11-5820-334-10	Operator's manual: Radio receiver R-392/URR.
TM 11-5820-334-20	Organizational maintenance manual: Radio receiver R-392/URR.
TM 11-5820-335-10	Operator's manual: Transmitters radio T-195/GRC-19, T-195A/GRC-19, and T-195B/GRC-19.
TM 11-5820-335-20	Organizational maintenance manual: Transmitter, radio T-195/GRC-19, T-195A/GRC-19, and T-195B/GRC-19.
TM 11-5820-292-10	Operator's manual: Radio sets AN/PRC-8, -8A, -9, -9A, -10, -10A, and -28.
TM 11-5820-295-10	Operator's manual: Radio set AN/GRC-19.
TM 11-5820-295-20	Organizational maintenance: Radio set AN/GRC-19.
TM 11-5820-295-35	Field and depot maintenance manual: Radio set AN/GRC-19.

TM 11-5820-348-15	Organizational, DS, GS, and depot maintenance manual: Antenna equipment RC-292.
TM 11-5820-398-12	Operator and organizational maintenance manual, including repair parts and special tools lists: Radio set AN/PRC-25.
TM 11-5820-401-ESC/1	Equipment serviceability criteria for Radio set AN/VRC-12.
TM 11-5820-401-ESC/2	Equipment serviceability criteria for Radio set AN/VRC-46.
TM 11-5820-401-ESC/3	Equipment serviceability criteria for Radio set AN/VRC-43.
TM 11-5820-401-ESC/4	Equipment serviceability criteria for Radio set AN/VRC-47.
TM 11-5820-401-ESC/5	Equipment serviceability criteria for Radio set AN/VRC-49.
TM 11-5820-401-ESC/7	Equipment serviceability criteria for Radio set AN/VRC-54.
TM 11-5820-498-12	Operator's and organizational maintenance manual: Radio sets AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 and amplifier-power supply groups OA-3633/GRC and OA-3633A/GRC.
TM 11-5820-549-12	Operator and organizational maintenance manual: Receiving set, radio AN/PRR-9 and transmitting sets, radio AN/PRT-4 and AN/PRT-4A.
TM 11-5820-670-12	Operator's and organizational maintenance manual including repair parts and special tool lists: Radio set AN/ARC-131.
TM 11-5820-667-12	Operator's and organizational maintenance manual including repair parts list: Radio set AN/PRC-77 (including receiver transmitter, radio RT-841/PRC-77).
TM 11-5820-713-15	Operator, organizational, DS, GS, and depot maintenance manual including repair parts and special tools lists: Radio terminal set AN/GRC-163.
TM 11-5821-204-12	Operator's and organizational maintenance manual: Radio set AN/ARC-44.
TM 11-5821-244-12	Operator's and organizational maintenance manual: Radio set AN/ARC-54 and control indicator C-8157/ARC.
TM 11-5821-259-20	Organizational maintenance manual including repair parts and special tool lists: Radio set AN/ARC-114; network, impedance matching-CU-1794/ARC-114; network, impedance matching-quadrature hybrid CU-1796/ARC-114.
TM 11-5821-276-15	Operator's, organizational, DS, GS, and depot maintenance manual (including repair parts and special tool lists): Communications central AN/ASC-10(V).
(O) TM 11-5821-279-12	Operator's and organizational maintenance manual: Communications central AN/ASC-11.
TM 11-5915-223-12	Operator's and organizational maintenance manual including repair parts and special tool lists: Suppressor electrical transient MX-7778/GRC and MX-7778A/GRC.
TM 11-5950-212-15	Operator's, organizational, DS, GS, and depot maintenance manual including repair parts and special tool lists: Transformer, variable power TF-523/U.
TM 11-5965-235-12	Organizational maintenance manual: Headset-microphone kits MK-400/G, MK-401/G, MK-525/G, and MK-526/G.
TM 11-5965-255-15P	Operator, organizational, field and depot maintenance repair parts and special tool lists: Loudspeaker, permanent magnet LS-454/U.
TM 11-5965-257-15	Organizational, DS, GS, and depot maintenance manual including repair parts and special tool lists: Handsets H-138/U and H-138A/U.
TM 11-5965-260-15P	Operator's organizational, field and depot maintenance repair parts and special tool lists: Headset, electrical H-140A/U.
TM 11-5965-262-13	Organizational and DS maintenance manual including repair parts and special tool lists: Headset microphone dynamic H-161/U and H-161A/U.
TM 11-5965-280-15	Operator, organizational, DS, GS, and depot maintenance manual including repair parts and special tools list: Handset H-189/GR.

TM 11–5965–282–15	Organizational, DS, GS, and depot maintenance manual including repair parts and special tool lists: Headset-microphone kit MK–1039/G.
TM 11–5985–262–15	Operator, organizational, DS, GS, and depot maintenance manual: including repair parts and special tool lists: Antenna AS–1729/VRC.
TM 11–6130–233–12	Operator and organizational maintenance manual including repair parts list: Power supplies PP–2953/U, PP–2953A/U, PP–2953B/U, and PP–2953C/U.
TM 11–6625–203–12	Operator and organizational maintenance: Multimeter AN/URM–105, including multimeter ME–77/U.
TM 11–6625–496–12	Operator's and organizational maintenance manual: Test set, radio AN/VRM–1 and AN/VRM–1A including repair parts and special tool lists.
TM 38–750	The Army Maintenance Management System (TAMMS).
TM 740–90–1	Administrative storage of equipment.
TM 750–244–2	Procedures for destruction of electronics materiel to prevent enemy use (Electronics Command).

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B1. General

This appendix provides a summary of the maintenance operations for the equipment. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

d. Adjust. Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly in a manner to allow the proper functioning of the equipment/system.

h. Replace. The act of substituting a serviceable like-type part, subassembly, model (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.

j. Overhaul. That periodic maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., (MWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of man-hours specified by the "Worktime" figure represents the average time required to restore an item (assembly, subassembly, com-

ponent, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in additional to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C ----------Operator/crew
O ----------Organizational
F ----------Direct Support
H ----------General Support
D ----------Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

B–4. Tool and Test Equipment Requirements (Table 1)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

SECTION II MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-12

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-12							
01	RECEIVER-TRANSMITTER, RADIO RT-246/VRC; RT-246A/VRC (SEE SECTION XII)							
03	RECEIVER, RADIO R-442/VRC; R-442A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION III. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-43

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-43							
01	RECEIVER-TRANSMITTER, RADIO RT-246/VRC; RT-246A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION IV. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-44

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-44							
01	RECEIVER-TRANSMITTER, RADIO RT-246/VRC; RT-246A/VRC (SEE SECTION XII)							
03	RECEIVER, RADIO R-442/VRC; R-442A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION V. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-45

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-45							
01	RECEIVER-TRANSMITTER, RADIO RT-246/VRC; RT-246A/VRC (SEE SECTION XII)							
03	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION VI. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-46

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-46							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION VII. MAINTENANCE ALLOCATION CHART
FOR

RADIO SET AN/VRC-47

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-47							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
03	RECEIVER, RADIO R-442/VRC; R-442A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION VIII. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-48

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	RADIO SET AN/VRC-48							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
03	RECEIVER, RADIO R-442/VRC; R-442A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION IX. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-49

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
				O	F	H	D	
00	RADIO SET AN/VRC-49							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							

SECTION X. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-54

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
				O	F	H	D	
00	RADIO SET AN/VRC-54							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							
05	RADIO SET AN/VRC-24, AN/VRC-24A (SEE SEPARATE MAC IN TM 11-5820-222-20)							

SECTION XI. MAINTENANCE ALLOCATION CHART FOR

RADIO SET AN/VRC-55

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
				O	F	H	D	
00	RADIO SET AN/VRC-55							
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC; RT-524A/VRC (SEE SECTION XII)							
04	ANTENNA AS-1729/VRC (SEE SECTION XII)							
06	RADIO SET AN/GRC-19 (SEE SEPARATE MAC IN TM 11-5820-295-20)							
07	ANTENNA EQUIPMENT RC-292 (SEE SEPARATE MAC IN TM 11-5820-348-15)							

SECTION XII. MAINTENANCE ALLOCATION CHART FOR

RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC; RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
01	RECEIVER-TRANSMITTER, RADIO RT-246/VRC; RT-246A/VRC	Inspect		0.5				
		Test		1.0				2,3
		Test			0.5			
		Test				0.5		4-15,24,25,26
		Test					0.5	4-27
		Service		0.5				1
		Adjust				0.5		4,5
		Adjust					0.75	4-22,24-27
		Align			0.5			4-11,13,24,25,26
		Align				0.5		4-15,24,25,26
		Install		0.75				1
		Replace		0.5				1
		Repair[1]		1.0				1
		Repair			0.1			4,5
		Repair				1.5		4,5
		Repair					3.0	
		Rebuild					5.0	
0101	PANEL AND HOUSING ASSEMBLY A3	Repair			1.0			4,5
		Rebuild					2.0	
0102	GEAR SET, HELICAL MATCHED MP1001	Replace				1.0		4,5
		Rebuild					2.0	
0103	CRYSTAL REFERENCE SYSTEM ASSY. A3000	Replace			0.5			4,5
		Repair					1.0	
010301	HARMONIC GENERATOR ASSEMBLY A3100	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010302	AMPLIFIER MIXER ASSEMBLY A3200	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010303	SECOND MIXER ASSEMBLY A3300	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010304	AMPLIFIER, INTERMEDIATE FREQ. A3400	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010305	AMPLIFIER, LIMITER A3500	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010306	DISCRIMENATOR, ELECTRICAL FREQ. A3600	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
010307	PHASE DISCRIMENATOR ASSY. A3700	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1

See footnotes at end of chart.

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
010308	CHASSIS ASSY, ELECTRICAL EQUIPMENT A1	Replace			0.5			4,5
		Repair				1.0		
0104	AMPLIFIER ASSEMBLY A4000	Align			0.25			6,7,9,10
		Replace				0.5		4,5
010401	AMPLIFIER ASSY., INTERMEDIATE FREQUENCY A4100	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
010402	DISCRIMINATOR, ELECTRICAL FREQUENCY A4200	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
010403	AMPLIFIER, AUDIO FREQUENCY A4300	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
010404	CHASSIS ASSY., ELECTRICAL EQUIPMENT A1				1.0			4,5
0105	AMPLIFIER; ASSEMBLY, IF. A5000	Align			0.25			6,9,10,11,13
		Replace			0.5			4,5
		Rebuild					1.0	
010501	AMPLIFIER, AUDIO FREQUENCY A5100	Align			0.25			6,9,10,11,13
		Replace			0.5			4,5
010502	AMPLIFIER, LIMITER A5200	Align			0.25			6,9,10,11,13
		Replace			0.5			4,5
010503	SQUELCH ASSEMBLY	Align			0.25			6,9,10,11,13
		Replace			0.5			4,5
010504	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT A1	Replace			0.5			4,5
		Repair				1.0		
0106	OSCILLATOR, BUFFER ASSEMBLY A6000	Replace				0.5		4,5
		Rebuild					2.0	
0107	SWITCH NULL ASSEMBLY A7000	Test					0.5	23
		Adjust					0.5	6,7,8,10,11
		Replace		0.5				1
0108	AMPLIFIER, MODULATOR A8000	Replace			0.1			4,5
		Rebuild					2.0	
010801	OSCILLATOR ASSEMBLY, RADIO FREQUENCY A8100	Test		0.5				3
		Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13,14
		Replace		0.5				1
01080101	MODULATOR, RADIO A8101	Test		0.5				3
		Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13,14
		Replace		0.5				1

SECTION XII. MAINTENANCE ALLOCATION CHART FOR

RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC; RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
010802	PHASE DISCRIMINATOR ASSEMBLY	Test		0.5				3
	A8200	Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13, 14,17
		Replace		0.5				1
010803	AMPLIFIER, INTERMEDIATE FREQUENCY	Test		0.5				23
	A8300	Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13, 14,17
		Replace		0.5				1
010804	GENERATOR, REFERENCE SIGNAL	Test		0.5				3
	A8400	Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13, 14,17
		Replace		0.5				1
010805	SQUELCH AMPLIFIER ASSEMBLY	Test		0.5				3
	A8500	Test					0.5	23
		Adjust					0.5	6,7,8,9,11,13, 14,17
		Replace		0.5				1
010806	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT	Replace			0.5			4,5
	A1	Rebuild					1.0	
0109	POWER SUPPLY ASSEMBLY	Test			0.5			7
	A9000	Replace			0.5			
		Repair				1.0		
		Rebuild					1.0	
010901	POWER SUPPLY ELECTRICAL ASSEMBLY	Replace				0.5		
	PS9001	Repair					1.0	
0110	REGULATOR, VOLTAGE ASSEMBLY	Test		0.25				3
	A2100	Test					0.25	23
		Adjust					0.25	6,7
		Replace		0.25				1
0111	CONTROL ASSEMBLY	Inspect		0.25				
	A300	Adjust				0.5		4,5
		Replace			0.5			4,5
		Repair					1.0	4,5
011101	TUNING UNIT, RADIO FREQUENCY	Replace				0.5		4,5
	A1000	Rebuild					1.0	
011102	OSCILLATOR ASSEMBLY, RADIO FREQUENCY	Adjust				0.5		4,5
	A2000	Replace[2]			0.5			4,5
		Replace					0.25	4,5
0112	SELECT CONTROL ASSEMBLY	Repair				0.5		
	A7100	Rebuild					1.0	
0113	AMPLIFIER, ELECTRICAL CONTROL ASSEMBLY	Adjust					0.5	6,7,8,10,11
	A7200	Repair			1.0			4,5
0114	CIRCUIT CARD ASSEMBLY	Replace			0.5			
	A9400	Repair			1.0			
		Rebuild					2.0	

See footnotes at end of chart.

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
0115	AMPLIFIER, RADIO FREQUENCY A6200	Replace				0.5		4,5
		Repair					0.5	
	TANK-CIRCUIT ASSEMBLY A6201	Replace			0.5			4,5
		Repair				0.1		
		Rebuild					1.0	
	GEAR SET, HELICAL MATCHED	Replace				0.5		4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6300	Replace			0.5			4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6400	Replace			0.5			
		Repair					1.0	
011501	AMPLIFIER, RADIO FREQUENCY ASSEMBLY A6100	Align			0.5			5,6,7,24,25
		Replace			0.5			4,5
		Repair				0.5		4,5
	AMPLIFIER ASSEMBLY AR6101	Replace					0.5	
		Repair				0.5		4,5
		Repair					0.5	
	CIRCUIT CARD ASSEMBLY TB6001	Replace				0.5		4,5
		Repair					0.5	
02	RECEIVER-TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC	Inspect		0.5				
		Test		1.0				2,3
		Test			0.5			
		Test				0.5		4-15,24,25,26
		Test					0.5	4-27
		Service		0.5				1
		Adjust				0.5		4,5
		Adjust					0.75	4-22,24-27
		Align			0.5			4-11,13,24,25,26
		Align				0.5		4-15,24,25,26
		Install		0.75				1
		Replace		0.5				1
		Repair[1]		1.0				1
		Repair			1.0			4,5
		Repair				1.5		4,5
		Repair					3.0	
		Rebuild					5.0	
0201	PANEL AND HOUSING ASSEMBLY A3	Repair			0.1			4,5
		Rebuild					2.0	
0202	GEAR SET, HELICAL MATCHED MP1001	Replace				1.0		4,5
		Rebuild					2.0	
0203	CRYSTAL REFERENCE SYSTEM ASSEMBLY A3000	Replace			0.5			4,5
		Repair					1.0	
020301	HARMONIC GENERATOR ASSEMBLY A3100	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1

See footnotes at end of chart.

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC; RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
020302	AMPLIFIER MIXER ASSEMBLY A3200	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020303	SECOND MIXER ASSEMBLY A3300	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020304	AMPLIFIER, INTERMEDIATE FREQUENCY A3400	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020305	AMPLIFIER, LIMITER A3500	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020306	DISCRIMINATOR, ELECTRICAL FREQUENCY A3600	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020307	PHASE DISCRIMINATOR ASSEMBLY A3700	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
020308	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT A1	Replace			0.5			4,5
		Repair				1.0		
0204	AMPLIFIER ASSEMBLY A4000	Align			0.25			6,7,9,10
		Replace				0.5		4,5
020401	AMPLIFIER ASSEMBLY, INTERMEDIATE FREQUENCY A4100	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
020402	DISCRIMINATOR, ELECTRICAL FREQUENCY A4200	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
020403	AMPLIFIER, AUDIO FREQUENCY A4300	Test		0.5				3
		Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
020404	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT A1				1.0			4,5

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
0205	AMPLIFIER ASSEMBLY, I.F. A5000	Align Replace Rebuild			0.25 0.5		 1.0	6,9,10,11,13 4,5
020501	AMPLIFIER, AUDIO FREQUENCY A5100	Align Replace			0.25 0.5			6,9,10,11,13 4,5
020502	AMPLIFIER, LIMITER A5200	Align Replace			0.25 0.5			6,9,10,11,13 4,5
020503	SQUELCH ASSEMBLY	Align Replace			0.25 0.5			6,9,10,11,13 4,5
020504	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT	Replace Repair			0.5	 1.0		4,5
0206	OSCILLATOR BUFFER ASSEMBLY A6000	Replace Rebuild				0.5	 2.0	4,5
0208	AMPLIFIER, MODULATOR A8000	Replace Rebuild			1.0		 2.0	4,5
020801	OSCILLATOR ASSEMBLY, RADIO FREQUENCY A8100	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13,14 1
02080101	MODULATOR, RADIO A8101	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13,14 1
020802	PHASE DISCRIMINATOR ASSEMBLY A8200	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13,14 1
020803	AMPLIFIER, INTERMEDIATE FREQUENCY A8300	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13,14 1
020804	GENERATOR, REFERENCE SIGNAL A8400	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13, 14,17,18,22 1
020805	SQUELCH AMPLIFIER ASSEMBLY A8500	Test Test Adjust Replace		0.5 0.5			 0.5 0.5	3 23 6,7,8,9,11,13, 14,17,18,22 1
020806	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT A1	Replace Rebuild		0.5			 1.0	4,5
0209	POWER SUPPLY ASSEMBLY A9000	Test Replace Repair Rebuild			0.5 0.5	 1.0	 1.0	7 4,5

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC; RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
020901	POWER SUPPLY ELECTRICAL ASSEMBLY PS 9001	Replace				0.5		
		Repair					1.0	
0210	REGULATOR, VOLTAGE ASSEMBLY A2100	Test		0.25				3
		Test					0.25	23
		Adjust					0.25	6,7
		Replace		0.25				1
0211	CONTROL ASSEMBLY A350	Inspect		0.25				
		Adjust				0.5		4,5
		Replace			0.5			4,5
		Repair					1.0	4,5
021101	TUNING UNIT, RADIO FREQUENCY A1000	Replace				0.5		4,5
		Rebuild					1.0	
021102	OSCILLATOR ASSEMBLY, RADIO FREQUENCY A2000	Adjust				0.5		4,5
		Replace[2]			0.5			4,5
		Replace					0.25	4,5
0214	CIRCUIT CARD ASSEMBLY A9400	Replace			0.5			
		Repair			1.0			
		Rebuild					2.0	
0215	AMPLIFIER, RADIO FREQUENCY A6200	Replace				0.5		4,5
		Repair					0.5	
	TANK-CIRCUIT ASSEMBLY A6201	Replace			0.5			4,5
		Repair				1.0		
		Rebuild					1.0	
	GEAR SET, HELICAL MATCHED	Replace				0.5		4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6300	Replace			0.5			4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6400	Replace			0.5			
		Repair					1.0	
021501	AMPLIFIER, RADIO FREQUENCY ASSEMBLY A6100	Align			0.5			5-7,24,25
		Replace			0.5			4,5
		Repair				0.5		4,5
	AMPLIFIER ASSEMBLY AR6101	Replace					0.5	
		Repair				0.5		4,5
		Repair					0.5	
	CIRCUIT CARD ASSEMBLY TB6001	Replace				0.5		4,5
		Repair					0.5	

See footnotes at end of chart.

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
03	RECEIVER, RADIO R-442/VRC, R-442A/VRC	Inspect		0.25				
		Test		0.5				2,3
		Test			0.5			4-11,13
		Test				1.0		4-15
		Test					0.5	4-23
		Service		0.5				
		Adjust				1.0		4,5
		Adjust					1.0	4-22
		Align			0.5			4-11,13
		Align				0.5		4-15
		Install		0.5				1
		Replace		0.25				1
		Repair[1]		1.0				1
		Repair			1.5			4,5
		Repair				1.5		4,5
		Repair					2.0	
		Rebuild					3.0	
0301	PANEL AND HOUSING ASSEMBLY A3	Repair			1.0			4,5
		Rebuild					2.0	
0302	GEAR SET, HELICAL MATCHED MP1001	Replace				1.0		4,5
		Rebuild					2.0	
0303	CRYSTAL REFERENCE SYSTEM ASSEMBLY A3000	Replace			0.5			4,5
		Repair					1.0	
030301	HARMONIC GENERATOR ASSEMBLY A3100	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030302	AMPLIFIER MIXER ASSEMBLY A3200	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030303	SECOND MIXER ASSEMBLY A3300	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030304	AMPLIFIER, INTERMEDIATE FREQUENCY A3400	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030305	AMPLIFIER, LIMITER A3500	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030306	DISCRIMINATOR, ELECTRICAL FREQUENCY A3600	Test		0.25				3
		Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1

See footnotes at end of chart.

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
030307	PHASE DISCRIMINATOR ASSEMBLY	Test		0.25				3
	A3700	Test					0.5	6,10-13,17,18,19
		Adjust					0.5	23
		Replace		0.5				1
030308	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT	Replace			0.5			4,5
	A1	Repair				1.0		
0304	AMPLIFIER ASSEMBLY	Align			0.25			6,7,9,10
	A4000	Replace				0.5		4,5
030401	AMPLIFIER ASSEMBLY, INTERMEDIATE FREQUENCY	Test		0.5				3
	A4100	Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
030402	DISCRIMINATOR, ELECTRICAL FREQUENCY	Test		0.5				3
	A4200	Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
030403	AMPLIFIER, AUDIO FREQUENCY	Test		0.5				3
	A4300	Test					0.5	23
		Align					0.25	6,7,10,11,12,14, 16,17
		Replace		0.5				1
030404	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT				1.0			4,5
	A1							
0305	AMPLIFIER ASSEMBLY, I.F.	Align			0.25			6,9,10,11,13
	A5000	Replace			0.5			4,5
		Rebuild					1.0	
030501	AMPLIFIER, AUDIO FREQUENCY	Align			0.25			6,9,10,11,13
	A5100	Replace			0.5			4,5
030502	AMPLIFIER, LIMITER	Align			0.25			6,9,10,11,13
	A5200	Replace			0.5			4,5
030503	SQUELCH ASSEMBLY	Align			0.25			6,9,10,11,13
		Replace			0.5			4,5
030504	CHASSIS ASSEMBLY, ELECTRICAL EQUIPMENT	Replace			0.5			4,5
		Repair				1.0		
0306	OSCILLATOR BUFFER ASSEMBLY	Replace				0.5		4,5
	A6000	Rebuild					2.0	
0310	REGULATOR, VOLTAGE ASSEMBLY	Test		0.25				3
	A2100	Test					0.25	23
		Adjust					0.25	6,7
		Replace		0.25				1
0311	CONTROL ASSEMBLY	Inspect		0.25				
	A350	Adjust				0.5		4,5
		Replace			0.5			4,5
		Repair					1.0	4,5
031101	TUNING UNIT, RADIO FREQUENCY	Replace				0.5		4,5
	A1000	Rebuild					1.0	

SECTION XII. MAINTENANCE ALLOCATION CHART
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
031102	OSCILLATOR ASSEMBLY, RADIO FREQUENCY A2000	Adjust				0.5		4,5
		Replace[2]			0.5			4,5
		Replace					0.25	4,5
0312	AMPLIFIER, RADIO FREQUENCY A6200	Replace				0.5		4,5
		Repair					0.5	
	TANK-CIRCUIT ASSEMBLY A6201	Replace			0.5			4,5
		Repair				1.0		
		Rebuild					1.0	
	GEAR SET, HELICAL MATCHED	Replace				0.5		4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6300	Replace			0.5			4,5
		Repair					1.0	
	CIRCUIT CARD ASSEMBLY A6400	Replace			0.5			
		Repair					1.0	
031201	AMPLIFIER, RADIO FREQUENCY A6100	Align			0.5			5,6,7,24,25
		Replace			0.5			4,5
		Repair				0.5		4,5
	AMPLIFIER ASSEMBLY AR6101	Replace					0.5	
		Repair				0.5		4,5
		Repair					0.5	
	CIRCUIT CARD ASSEMBLY TB6001	Replace				0.5		4,5
		Repair					0.5	
04	ANTENNA AS-1729/VRC (SEE SEPARATE MAC IN TM 11-5985-262-15)							

(1) Repair by replacement of modules, internal cable assemblies, filters, relays.
(2) Except circuit board.

TABLE 1 TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
RECEIVER-TRANSMITTERS, RADIO RT-246/VRC, RT-246A/VRC, RT-524/VRC, AND RT-524A/VRC;
RECEIVERS, RADIO R-442/VRC AND R-442A/VRC; AND ANTENNA AS-1729/VRC

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
2	O	MULTIMETER AN/URM-105	6625-00-581-2036	
3	O	TEST SET, RADIO AN/VRM, AN/VRM-1A	6625-00-892-5542	
4	F,H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	F,H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
6	F,H,D	POWER SUPPLY PP-1104/U	6130-00-542-6385	
7	F,H,D	MULTIMETER ME-26B/U	6625-00-646-7409	
8	F,H,D	MULTIMETER TS-325B/U	6625-00-553-0142	
9	F,H,D	GENERATOR, SIGNAL AN/URM-103	6625-00-868-8352	
10	F,H,D	VOLTMETER, ELECTRONIC ME-30C/U	6625-00-643-1670	
11	F,H,D	GENERATOR, SIGNAL AN/URM-127	6625-00-783-5965	
12	H,D	GENERATOR SIGNAL AN/GRM-50	6625-00-868-8353	
13	F,H,D	DIGITAL READOUT, ELECTRONIC COUNTER AN/USM-207	6625-00-911-6368	
14	H,D	ANALYZER, SPECTRUM TS-723B/U	6625-00-668-9418	
15	H,D	ATTENUATOR, VARIABLE CN-796/U	5985-00-087-2597	
16	D	R.F. SIGNAL GENERATOR AN/URM-250	6625-00-649-5193	
17	D	OSCILLOSCOPE AN/USM-281A	6625-00-228-2201	
18	D	AMPLIFIER RADIO FREQUENCY AM-3495/U	6625-00-985-8891	
19	D	TEST SET, RADIO AN/USM-306(V)1	6625-00-459-8568	
20	D	AUDIO OSCILLATOR, HEWLETT PACKARD HP-200AB		
21	D	VOLTMETER, ELECTRONIC AN/USM-78A	6625-00-753-2115	
22	D	ANALYZER ZM-3/U	6625-00-229-1060	
23	D	MODULE ELEMENT TEST SET AN/USM-72 (LEXINGTON DEPOT)		
24	F,H,D	RADIO FREQUENCY WATTMETER AN/URM-120	6625-00-813-8430	
25	F,H,D	DUMMY LOAD ELECTRICAL DA-75/U	6625-00-177-1639	
26	F,H,D	VOLTMETER, ELECTRONIC AN/URM-145	6625-00-973-3986	
27	D	WATTMETER BIRD ELECTRONICS MODEL 61 (2½ - 10 WATTS)		

APPENDIX C

ORGANIZATIONAL REPAIR PARTS LISTS

Section I. INTRODUCTION

C-1. Scope

This appendix contains lists of repair parts required for performance of organizational maintenance for the following equipment:

Equipment	*Section*	*Remarks*
Radio Sets AN/VRC-12, -43, through -49, -54, and -55	II	
Receiver-Transmitter, Radio RT-246/VRC, RT-246A/VRC	III, IV	Part of Radio Sets AN/VRC-12, -43, -44, and -45 [a]
Receiver-Transmitter, Radio RT-524/VRC, RT-524A/VRC	V, VI	Part of Radio Sets AN/VRC-46, -47, -48, -49, -54, and -55 [a]
Receiver, Radio R-442/VRC, R-442A/VRC	VII, VIII	Part of Radio Sets AN/VRC-12, -44, -47, and -48 [a]
Antenna AT-912/VRC	IX	
Control, Radio Set C-2299/VRC	X	Used with AN/VRC-45, -49, -54, and -55
Control, Frequency Selector C-2742/VRC	XI	Used with RT-246/VRC and RT-246A/VRC
Mounting MT-1029/VRC	XII	Used with RT-246/VRC, RT-246A/VRC, RT-524/VRC, and RT-524A/VRC
Mounting MT-1898/VRC	XIII	Used with R-442/VRC and R-442A/VRC

[a] Refer to paragraph C-4 for publications covering repair parts for other components of these radios.

C-2. General

The repair parts and special tools lists for the receiver-transmitters, R-442/VRC, and R-442A/VRC are divided into two sections:

a. Repair Parts for Organizational Maintenance. A list of parts authorized for performance of maintenance at organizational level.

b. Federal Stock Number Cross-Reference Index. A cross-reference index of Federal stock numbers to illustrations by figure number and item number (reference designation).

C-3. Explanation of Columns

a. Source, Maintenance and Recoverability Codes (SMR), Column 1.

(1) *Source code.* This code (first two letters) indicates the manner of acquiring support items for maintenance, repair, or overhaul of indicated item. Source codes are:

Code	*Explanation*
PA	—Item procured and stocked for anticipated or known useage.
PB	—Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply systems.
PC	—Item procured and stocked and which otherwise would be code PA except that it is deteriorative in nature.
PE	—Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.
PF	—Support equipment which will not be stocked but which will be centrally procured on demand.
PG	—Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to the equipment which because of probable discontinuance or shutdown of production facilities would prove uneconomical to reproduce at a later time.
KD	—An item of depot overhaul/repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.
KF	—An item of a maintenance kit and not purchased separately. Maintenance kit

Code	Explanation
	defined as a kit that provides an item that can be replaced at organizational or direct support or general support levels of maintenance.
KB	—Item included in both a depot overhaul/repair kit and a maintenance kit.
MO	—Item to be manufactured or fabricated at organizational level.
MF	—Item to be manufactured or fabricated at direct support maintenance level.
MH	—Item to be manufactured or fabricated at general support maintenance level.
MD	—Item to be manufactured or fabricated at depot maintenance level.
AO	—Item to be assembled at organizational level.
AF	—Item to be assembled at direct support maintenance level.
AH	—Item to be assembled at general support maintenance level.
AD	—Item to be assembled at depot maintenance level.
XA	—Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	—Item is not procured or stocked. If not available through salvage, requisition.
XC	—Installation drawing, diagram instruction sheet, field service drawing, that is identified by manufacturers' part number.
Blank	—Support items listed in this RPSTL-TM assigned maintenance and recoverability codes and no source codes can be requisitioned with justification.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source-coded above except those coded XA, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance codes.* Maintenance codes (third and fourth letters) are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth position of the Uniform SMR Code Format as follows:

(*a*) *Use* (*third position*). The maintenance code entered in the third position indicates the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position indicates one of the following levels of maintenance.

Code	Explanation
O	—Support item is removed, replaced, used at the organizational level of maintenance.

NOTE

A code "C" may be used in this position to denote crew or operator maintenance performed within organizational maintenance.

F	—Support item is removed, replaced, used at direct support (DS) maintenance level.
H	—Support item is removed, replaced, used at general support (GS) maintenance level.
D	—Support item is removed, replaced, used at depot maintenance level.

(*b*) *Repair* (*fourth position*). The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). When a maintenance code is not used, a dash (—) sign is entered. For multi-service equipment/systems or when a code is entered, this position will contain one of the following maintenance codes assigned by the service(s) that require the code.

Code	Application/Explanation
O	—The lowest maintenance level capable of complete repair of the support item is organizational maintenance.
F	—The lowest maintenance level capable of complete repair of the support item is direct support maintenance.
H	—The lowest maintenance level capable of complete repair of the support item is general support.
D	—The lowest maintenance level capable of complete repair of the support item is depot.
L	—Repair is restricted to designated specialized repair activity.
Z	—Non-repairable. No repair is authorized.
B	—No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc., at the user level. No parts or special tools are procured for the maintenance of this item.

(3) *Recoverability code.* Recoverability codes (fifth letter) are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in

the fifth position of the uniform SMR Code Format as follows.

Code	*Explanation*
Z	—Nonrepairable item. When unserviceable, condemn and dispose at the level indicated in the first letter of the maintenance code ((2) (*a*) above).
O	—Repairable item. When uneconomically repairable, condemn and dispose at organizational level.
F	—Repairable item. When uneconomically repairable, condemn and dispose at direct support level.
H	—Repairable item. When uneconomically repairable, condemn and dispose at general support level.
L	—Repairable item. Repair, condemnation, and disposal not authorized below depot Specialized Repair Activity level.
A	—Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material, or hazardous material).

b. Federal Stock Number. This column indicates the Federal stock number (FSN) assigned to the item and will be used for requisitioning purposes.

c. Description, column 3. This column indicates the Federal item name and a minimum description required to identify the item. The reference number (A001, A059, A060, etc.) identifies the position of the item in the Provisioning Worksheet. The last line indicates the applicable Federal Supply Code for Manufacturer (FSCM) followed by the manufacturers part number. The FSCM is used to designate the manufacturer, distributor, or Government agency, and is identified in SB 708–42 and paragraph C–6.

d. Unit of Measure, Column 4. The unit used as a basis of issue; e.g. ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit, Column 5. The actual quantity of the item in the equipment is listed in this column.

f. 15-Day Organizational Maintenance Allowance, Column 6. The items authorized for use as required but not for initial stockage are identified with an asterisk (*) in the columns.

g. Illustrations, Column 7.

(1) *Figure No., column 7a.* The number of the illustration in which the item is shown is identified in this column.

(2) *Item No. or reference designation, column 7b.* The reference designation used to identify the item in the illustration is identified in this column.

C–4. Special Information

The following publications contain repair parts information for indicated equipment.

Equipment	*Publication*
Accessory Kit MX–1137/GRA–12 (p/o AN/VRC–55)	SM SIG 7&8 AN/GRA–12
Antenna Equipment RC–292 (p/o AN/VRC–55)	TM 11–5820–348–25P
Antenna AS–1729/VRC (p/o AN/VRC–12, –43 through –49)	TM 11–5985–262–15
Radio Set AN/GRC–19 (p/o AN/VRC–55)	TM 11–5820–295–20P
Radio Set AN/PRC–25 (p/o AN/VRC–54)	TM 11–5820–398–12
Radio Set AN/VRC–24(*) (p/o AN/VRC–54)	TM 11–5820–222–20P
Receiver, Radio R–392/URR (p/o AN/GRC–19)	TM 11–5820–334–20P

C–5. How to Locate Repair Parts

a. To locate a part in the repair parts list or the illustration in which the part is shown, refer to Index Cross-Reference section applicable to the equipment in question.

b. To locate a part when the Federal stock number is known, refer to Index Cross-Reference.

C–6. Federal Supply Code for Manufacturers (FSCM) List

Following manufacturer codes are identified as follows:

Code	*Manufacturmer/Government agency*
80063	US Army Electronics Command
96906	Military Standards Promulgated by Standardization Division, Directorate of Logistics Services, DSA
88044	Army Air Force Drawings under Custodianship of the Air Force

SECTION II. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (AN/VRC-12, -43 thru -49, -54, -55)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code — USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 5i-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
		NOTE: Refer to section III for RT-246/VRC and RT-246A/VRC repair parts. Refer to section V for RT-524/VRC and RT-524A/VRC repair parts. Refer to section VII for R-442/VRC and R-442A/VRC repair parts. Refer to TM 11-5985-262-15 for AS-1729/VRC repair parts.								
	5820223741 2	RADIO SET AN/VRC-12:							E,1-7	
PAOFD	5820892062 3	RECEIVER-TRANSMITTER, RADIO RT-246/VRC, RT-246A/VRC	ea	1	•	•	•	•		
PAOFD	5820892062 4	RECEIVER, RADIO R-442/VRC, R-442A/VRC	ea	1	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223741 5	RADIO SET AN/VRC-43:							F,1-7	
PAOFD	5820892062 3	RECEIVER-TRANSMITTER, RADIO RT-246/VRC, RT-246A/VRC	ea	1	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223741 7	RADIO SET AN/VRC-44:							G,1-7	
PAOFD	5820892062 3	RECEIVER-TRANSMITTER, RADIO RT-246/VRC, RT-246A/VRC	ea	1	•	•	•	•		
PAOFD	5820892062 4	RECEIVER, RADIO R-442/VRC, R-442A/VRC	ea	2	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223741 8	RADIO SET AN/VRC-45:							H,1-7	
PAOFD	5820892062 3	RECEIVER-TRANSMITTER, RADIO RT-246/VRC, RT-246A/VRC	ea	2	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	2	•	•	•	•		
	5820223743 3	RADIO SET AN/VRC-46:							I,1-7	
PAOFD	5820892062 2	RECEIVER TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC	ea	1	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223743 4	RADIO SET AN/VRC-47:							J,1-7	
PAOFD	5820892062 2	RECEIVER-TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC	ea	1	•	•	•	•		
PAOFD	5820892062 4	RECEIVER, RADIO R-442/VRC, R-442A/VRC	ea	1	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223743 5	RADIO SET AN/VRC-48:							K,1-7	
PAOFD	5820892062 2	RECEIVER-TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC	ea	1	•	•	•	•		
PAOFD	5820892062 4	RECEIVER, RADIO R-442/VRC, R-442A/VRC	ea	2	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	1	•	•	•	•		
	5820223743 7	RADIO SET AN/VRC-49:							L,1-7	
PAOFD	5820892062 2	RECEIVER-TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC	ea	2	•	•	•	•		
PAOFD	59859859024	ANTENNA AS-1729/VRC	ea	2	•	•	•	•		
	5820223756 7	RADIO SET AN/VRC-54:							6-13	
PAOFD	5820223743 3	RADIO SET AN/VRC-46	ea	1	•	•	•	•		
PAOFD	5820402226 4	RADIO SET AN/VRC-24	ea	1	•	•	•	•		
	OR	OR								
PAOFD	5820223741 3	RADIO SET AN/VRC-24A (Refer to TM 11-5820-222-20P for repair parts.)	ea	1	•	•	•	•		
PAOFD	5820857075 9	RADIO SET AN/PRC-25 (Refer to TM 11-5820-398-12 for repair parts.)	ea	1	•	•	•	•	6-14	
	5820402226 5	RADIO SET AN/VRC-55:							6-17	
PAOFD	5820223743 3	RADIO SET AN/VRC-46	ea	1	•	•	•	•		
PAOFD	5820223740 9	RADIO SET AN/GRC-19 (Refer to TM 11-5820-295-20P for repair parts.)	ea	1	•	•	•	•		
PAOFD	5820497855 4	ANTENNA EQUIPMENT RC-292 (Refer to TM 11-5820-348-25P for repair parts.)	ea	1	•	•	•	•		
PAOFD	5820378471 8	ACCESSORY KIT MX-1137/GRA-12 (Refer to SM SIG 748 AN/GRA-12 for repair parts.)	ea	1	•	•	•	•		

SECTION III. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (RT-246, RT-246A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PAOFD	5820892062 3	A001 RECEIVER-TRANSMITTER, RADIO RT-246/VRC, RT-246A/VRC 80063; SMD413501		ea	1					C-1	
PBODZ	5815892201 3	A059 FILTER, LOW PASS: 80063; SMD413503		ea	1	*	*	*	*	C-4	FL401
PBOFZ	5995823260 0	A060 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR10		ea	1	*	*	*	*	C-4	FL401W410
PBOFZ	5995823260 8	A064 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR11		ea	1	*	*	*	*	C-4	FL401W411
PBOFZ	5820-8586483	A072 SHIELD PLATE ASSEMBLY: 80063; SMD413551		ea	1	*	*	*	*	C-4	E1
PBOFZ	5995853677 5	A100 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR4		ea	1	*	*	*	*	C-4	W202/W402
PBOZZ	5945853645 0	A114 ARMATURE,RELAY: 80063; SMD413526		ea	1	*	*	*	*	C-8	K3001
PBOFD	5820-8535957	A115 HARMONIC GENERATOR ASSEMBLY: 80063; SMB413559		ea	1	*	*	*	*	C-8	A3100
PBOFD	5820858646 3	A151 AMPLIFIER, MIXER ASSEMBLY: 80063; SMB413592		ea	1	*	*	*	*	C-8	A3200
PBOFD	5820853595 9	A185 SECOND MIXER ASSEMBLY: 80063; SMB413611		ea	1	*	*	*	*	C-8	A3300
PBOFZ	5995823293 5	A202 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR5		ea	1	*	*	*	*	C-4	W403
PBOFD	5820853596 2	A222 AMPLIFIER, INTERMEDIATE FREQUENCY: 80063; SMB413634		ea	1	*	*	*	*	C-8	A3400
PBOFD	5820898443 7	A257 AMPLIFIER, LIMITER: 80063; AMB413650		ea	1	*	*	*	*	C-8	A3500
PBOFD	5820853597 0	A294 DISCRIMINATOR, ELECTRICAL FREQUENCY 80063; SMB413670		ea	1	*	*	*	*	C-8	A3600
PBOFD	5820853596 9	A335 PHASE DISCRIMINATOR ASSEMBLY: 80063; SMB413699		ea	1	*	*	*	*	C-8	A3700
PBOFZ	5995823293 7	A358 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR6		ea	1	*	*	*	*	C-5	W404
PBOFD	5915849346 6	A431 FILTER,BANDPASS: 80063; SMD413719		ea	1	*	*	*	*	C-9	FL4001
PBOFD	5915849346 7	A432 FILTER, BANDPASS: 80063; SMD413720		ea	1	*	*	*	*	C-9	FL4002
PBOFD	5820853596 3	A449 AMPLIFIER ASSEMBLY, INTERMEDIATE FREQUENCY 80063; SMC413726		ea	1	*	*	*	*	C-9	A4100
PBOFD	5820858648 0	A496 DISCRIMINATOR, ELECTRICAL FREQUENCY: 80063; SMD413753		ea	1	*	*	*	*	C-9	A4200
PBOFD	5820936257 7	A589 AMPLIFIER, AUDIO FREQUENCY: 80063; SMB413785		ea	1	*	*	*	*	C-9	A4300
PBOFZ	5999823324 9	A645 SHIELD PLATE ASSEMBLY: 80063; SMD414273		ea	1	*	*	*	*	C-10	E1
PBOFD	5820884247 9	A656 OSCILLATOR, RADIO FREQUENCY: 80063; SMB414176		ea	1	*	*	*	*	C-10	A8100
PBOFD	5820884247 6	A712 PHASE DISCRIMINATOR ASSEMBLY: 80063; SMB414215		ea	1	*	*	*	*	C-10	A8200
PBOFD	5820884247 8	A764 AMPLIFIER, INTERMEDIATE FREQUENCY ASSEMBLY: 80063; SMB414197		ea	1	*	*	*	*	C-10	A8300
PBOFZ	5995823260 3	A782 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR9		ea	1	*	*	*	*	C-4	W409
PBOFD	5821089920 8	A806 GENERATOR, REFERENCE SIGNAL: 80063; SMB374963		ea	1	*	*	*	*	C-10	A8400
PBOFD	5820884247 7	A850 SPEECH AMPLIFIER ASSEMBLY: 80063; SMB414238		ea	1	*	*	*	*	C-10	A8500

SECTION III. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (CONTINUED) (RT-246, RT246A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFZ	59458535946	A945 ARMATURE, RELAY: 80063; SMC414823		ea	1	*	*	*	*	C-11	K5001
PBOFZ	59458534945	A946 ARMATURE, RELAY: 80063; SMC414824		ea	1	*	*	*	*	C-11	K5001
PBOFD	58208535960	B019 AMPLIFIER, AUDIO FREQUENCY: 80063; SMC413834		ea	1	*	*	*	*	C-11	A5100
PBOFD	58208535968	B069 AMPLIFIER, LIMITER: 80063; SMC413849		ea	1	*	*	*	*	C-11	A5200
PBOFD	59158493468	B130 SQUELCH ASSEMBLY: 80063; SMB413860		ea	1	*	*	*	*	C-11	A5300
PBOFZ	59958232934	B245 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR8		ea	1	*	*	*	*	C-4	W407
PBOFZ	59958232599	C108 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR13		ea	1	*	*	*	*	C-4	W303
PBOHD	58208842498	C498 SWITCH, NULL ASSEMBLY: 80063; SMC414770		ea	1	*	*	*	*	C-12	A7000
PBOZZ	58208325506	C597 COVER: 80063; SMD414382		ea	1	*	*	*	*	C-13	MP3
PBOZZ	53556169659	C598 KNOB: 96906; MS91525-1		ea	1	*	*	*	*	C-13	MP4
PBOZZ	53556169659	C599 KNOB: SAME AS C598		ea	1	*	*	*	*	C-13	MP5
PBOZZ	53556169659	C600 KNOB: SAME AS C598		ea	1	*	*	*	*	C-13	MP6
PBOZZ	53556169659	C601 KNOB: SAME AS C598		ea	1	*	*	*	*	C-13	MP7
PBOZZ	53558536353	C602 KNOB: 80063; SMC414393		ea	1	*	*	*	*	C-13	MP8
PBOZZ	53558536384	C603 KNOB: 80063; SMC414399		ea	1	*	*	*	*	C-13	MP9
PBOZZ	53550599188	C604 KNOB: 80063; SMC414401		ea	1	*	*	*	*	C-13	MP10
PBOZZ	62401557836	C605 LAMP, INCANDESCENT: 96906; MS25237-327		ea	1	*	*	*	*	C-13	DS302
PBOZZ	62401557836	C606 LAMP, INCANDESCENT: SAME AS C605		ea	1	*	*	*	*	C-13	DS302A
PBOZZ	59358230752	C629 COVER: 80063; SMC414381		ea	1	*	*	*	*	C-13	A1
PBOZZ	58208592585	C644 CAP ASSEMBLY: 80063; SMB414407		ea	1	*	*	*	*	C-13	A4
PBOFZ	53072920618	C646 PACKING, PREFORMED: 88044; AN6227-7		ea	1	*	*	*	*	C-13	A4MP2
PBOFZ	59458232609	D739 RELAY, ARMATURE: 80063; SMC414133		ea	1	*	*	*	*	5-16	K401
PBOFZ	59458232609	D740 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K402
PBOFZ	59458232609	D741 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K403
PBOFZ	59458232609	D742 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-9	K405
PBOFZ	59458232609	D743 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K406
PBOFZ	59458232610	D744 RELAY, ARMATURE: 80063; SMC414125		ea	1	*	*	*	*	5-16	K404

SECTION II. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (CONTINUED) (RT-246, RT-246A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFZ	62014354780	D630 LIGHT, INDICATOR: 80063; SMC374827-1	ea	1	*	*	*	*	C-13	DS301
PBOFZ	62108532180	D632 LENS, CAP: 80063; SMB318002-3	ea	1	*	*	*	*	C-13	
PBOFD	58208586498	D853 REGULATOR, VOLTAGE: 80063; SMD414157	ea	1	*	*	*	*	C-16	A2101
PBOFD	58200577756	HANDLE ASSEMBLY, RIGHT-HAND (FOR RT-246/VRC MODEL ONLY)	EA	L	*	*	*	*	A, 1-8	
PBOFD	58200890911	HANDLE ASSEMBLY, LEFT-HAND (FOR RT-246/VRC MODEL ONLY)	EA	1	*	*	*	*	A, 1-8	
PBOZZ	53057640071	SCREW, MACHINE (SUBSTITUTE FOR HANDLE ASSEMBLIES CAPTIVE SCREWS)	EA	13	*	*	*	*		

SECTION III. INDEX-FEDERAL STOCK NUMBER AND REFERENCE NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (RT-246, RT-246A)

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5305764007I		MACH SCREW
53302920618	C-13	A2MP2
53550599188	C-13	1A300MP10
53556169659	C-13	1A300MP4
53556169659	C-13	1A300MP5
53556169659	C-13	1A300MP6
53556169659	C-13	1A300MP7
53558536353	C-13	1A300MP8
53558536384	C-13	1A300MP9
58200577756	A,1-8	HANDLE ASSEMBLY
58208325506	C-13	1A300MP3
58200890911	A,1-8	HANDLE ASSEMBLY
58208535957	C-8	1A3000A3100
58208535959	C-8	1A3000A3300
58208535960	C-11	1A5000A5100
58208535962	C-8	1A3000A3400
58208535963	C-9	1A4000A4100
58208535968	C-11	1A5000A5200
58208535969	C-8	1A3000A3700
58208535970	C-8	1A3000A3600
58208586463	C-8	1A3000A3200
58208586480	C-9	1A4000A4200
58208586483	C-4	1A3000E1
58208586498	C-16	1A2100A2101
58208592585	C-9	1A300A4
58208842476	C-10	1A8000A8200
58208842477	C-10	1A8000A8500
58208842478	C-10	1A8000A8300
58208842479	C-10	1A8000A8100
58209362577	C-9	1A4000A4300
58208984437	C-8	1A3000A3500
58210899208	C-10	1A8000A8400

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF DESIGNATION
59158493466	C-9	1A4000FL4001
59158493467	C-9	1A4000FL4002
59158493468	C-11	1A5000A5300
59158923013	C-4	1FL401
59358230752	C-13	1A300A1
59458232609	5-16	K401, K402, K403, K406
59458232609	5-9	K405
59458232610	5-16	K404
59458535945	C-11	1A5000K5002
59458535946	C-11	1A5000K5001
59458536450	C-8	1A3000K3001
59958232599	C-4	1A300A1000A1001VR1001 TB1001W303
59958232600	C-4	1FL401W410
59958232603	C-4	1A8000AB300A8301W409
59958232608	C-4	1FL401W411
59958232934	C-4	1A6200A6100AR6101W407
59958232935	C-4	1A3000A3300A3301W403
59958232937	C-5	1A3000A3700A3701W404
59958536775	C-4	A13000W202/W402
59998233249	C-10	A8000E1
62108532180	C-13	1A300DS301MP2
62101557836	C-13	1A300DS302
62101557836	C-13	1A300DS302A

SECTION V. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (RT-524, RT-524A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code / USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	5820892062 2	A001 RECEIVER-TRANSMITTER, RADIO RT-524/VRC, RT-524A/VRC 80063; SMD414826	ea	1					C-2	
PBOFZ	5915892201 3	A059 FILTER, LOW PASS: SMD413503	ea	1	*	*	*	*	C-4	FL401
PBOFZ	5995823260 0	A060 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR10	ea	1	*	*	*	*	C-4	FL401W410
PBOFZ	5995823260 8	A064 CABLE ASSEMBLY, RADIO FREQUENCY: 80063 SMD414364-GR11	ea	1	*	*	*	*	C-4	FL401W411
PBOFD	5820858648 3	A072 SHIELD PLATE ASSEMBLY: 80063; SMD413551	ea	1	*	*	*	*	C-4	E1
PBOFZ	5995853677 5	A100 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR4	ea	1	*	*	*	*	C-4	W202/W402
PBOFZ	5945853645 0	A114 RELAY, ARMATURE: 80063; SMD413526	ea	1	*	*	*	*	C-8	K3001
PBOFD	5820853595 7	A115 HARMONIC GENERATOR ASSEMBLY: 80063; SMB413559	ea	1	*	*	*	*	C-8	A3100
PBOFD	5820858646 3	A151 AMPLIFIER, MIXER ASSEMBLY: 80063; SMB413592	ea	1	*	*	*	*	C-8	A3200
PBOFD	5820853595 9	A185 SECOND MIXER ASSEMBLY: 80063; SMB413611	ea	1	*	*	*	*	C-8	A3300
PBOFZ	5995823293 5	A202 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR5	ea	1	*	*	*	*	C-8	W403
PBOFD	5820853596 2	A222 AMPLIFIER, INTERMEDIATE FREQUENCY: 80063; SMB413634	ea	1	*	*	*	*	C-8	A3400
PBOFD	5820898443 7	A257 AMPLIFIER, LIMITER: 80063; SMB413650	ea	1	*	*	*	*	C-8	A3500
PBOFD	5820853597 0	A294 DISCRIMINATOR, ELECTRICAL FREQUENCY: 80063; SMB413670	ea	1	*	*	*	*	C-8	A3600
PBOFD	5820853596 9	A335 PHASE DISCRIMINATOR ASSSEMBLY: 80063; SMB413699	ea	1	*	*	*	*	C-8	A3700
PBOFZ	5995823293 7	A358 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR6	ea	1	*	*	*	*	C-5	W404
PBOFD	5915849346 6	A431 FILTER, BAND PASS: 80063; SMD413719	ea	1	*	*	*	*	C-9	FL4001
PBOFD	5915849346 7	A432 FILTER, BAND PASS: 80063; SMD413720	ea	1	*	*	*	*	C-9	FL4002
PBOFD	5820853596 3	A449 AMPLIFIER ASSEMBLY, INTERDEDIATE FREQUENCY: 80063, SMC413726	ea	1	*	*	*	*	C-9	A4100
PBOFD	5820858648 0	A496 DISCRIMINATOR, ELECTRICAL: 80063; SMC413753	ea	1	*	*	*	*	C-9	A4200
PBOFD	5820936257 7	A589 AMPLIFIER, AUDIO FREQUENCY: 80063; SMB413785	ea	1	*	*	*	*	C-9	A4300
PBOFZ	5999823324 9	A645 SHIELD PLATE ASSEMBLY: 80063; SMD414273	ea	1	*	*	*	*	C-10	E1
PBOFD	5820884247 9	A656 OSCILLATOR, RADIO FREQUENCY: 80063; SMB414176	ea	1	*	*	*	*	C-10	A8100
PBOFD	5820884247 6	A712 PHASE DISCRIMINATOR ASSEMBLY: 80063; SMB414215	ea	1	*	*	*	*	C-10	A8200
PBOFD	5820884247 8	A764 AMPLIFIER, INTERMEDIATE FREQUENCY: 80063; SMB414197	ea	1	*	*	*	*	C-10	A8300
PBOFZ	5995823260 3	A782 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR9	ea	1	*	*	*	*	C-4	W409
PBOFD	5821089920 8	A806 GENERATOR, REFERENCE SIGNAL: 80063; SMB374963	ea	1	*	*	*	*	C-10	A8400
PBOFD	5820884247 7	A850 SPEECH AMPLIFIER ASSEMBLY: 80063; SMB414238	ea	1	*	*	*	*	C-10	A8500

SECTION V. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (CONTINUED)(RT-524, RT-524A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFZ	59458535946	A945 ARMATURE, RELAY: 80063; AMD414823		ea	1	*	*	*	*	C-11	K5002
PBOFZ	59458535945	A946 ARMATURE, RELAY: 80063; SMC414824		ea	1	*	*	*	*	C-11	K5001
PBOFD	58208535960	B019 AMPLIFIER, AUDIO FREQUENCY: 80063; SMC413834		ea	1	*	*	*	*	C-11	A5100
PBOFD	58208535968	B069 AMPLIFIER, LIMITER: 80063; SMC413849		ea	1	*	*	*	*	C-11	A5200
PBOFD	59158493468	B130 SQUELCH ASSEMBLY: 80063; SMB413860		ea	1	*	*	*	*	C-11	A5300
PBOFZ	59958232934	B245 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR8		ea	1	*	*	*	*	C-4	W407
PBOFZ	59958232599	C108 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR13		ea	1	*	*	*	*	C-4	W303
PBOZZ	58208325506	C468 COVER: 80063; SMD414382		ea	1	*	*	*	*	C-14	MP6
PBOZZ	59358230752	C469 COVER ASSEMBLY: 80063; SMD 414381		ea	1	*	*	*	*	C-14	A1
PBOZZ	53558536353	C475 KNOB: 80063; SMC414393		ea	1	*	*	*	*	C-14	MP7
PBOZZ	53558536384	C476 KNOB: 80063; SMC414399		ea	1	*	*	*	*	C-14	MP8
PBOZZ	53550599188	C477 KNOB: 80063; SMC414401		ea	1	*	*	*	*	C-14	MP9
PBOZZ	53558893424	C478 KNOB: 80063; SMC447052		ea	1	*	*	*	*	C-14	MP10
PBOZZ	53556199659	C479 KNOB; 96906; MS91525-1		ea	1	*	*	*	*	C-14	MP11
PBOZZ	53556199659	C480 KNOB: SAME AS C479		ea	1	*	*	*	*	C-14	MP12
PBOZZ	53556199659	C481 KNOB: SAME AS C479		ea	1	*	*	*	*	C-14	MP13
PBOZZ	53556199659	C482 KNOB: SAME AS C479		ea	1	*	*	*	*	C-14	MP14
PBOZZ	62108532180	C485 CAP, LENS: 80063; SMB318002-3		ea	1	*	*	*	*	C-14	MP2
PBOZZ	62401557836	C486 LAMP, INCANDESCENT: 96906; MS25237-327		ea	1	*	*	*	*	C-14	DS352
PBOZZ	62401557836	C487 LAMP, INCANDESCENT: SAME AS C486		ea	1	*	*	*	*	C-14	DS352A
PBOZZ	58208592585	C505 CAP ASSEMBLY: 80063; SMC414407		ea	1	*	*	*	*	C-14	A2
PBOFZ	53302920618	C507 PACKING, PREFORMED: 88044; AN6227-7		ea	1	*	*	*	*	C-14	A2MP2
PBOFZ	53304422464	C712 GASKET: 80063; SMB414511		ea	1	*	*	*	*		MP4
PBOFD	58208586498	D211 REGULATOR, VOLTAGE: 80063; SMD414157		ea	1	*	*	*	*	C-16	A2101
PBOFZ	59458232609	D097 RELAY, ARMATURE: 80063; SMC414133		ea	1	*	*	*	*	5-16	K401
PBOFZ	59458232609	D098 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K402
PBOFZ	59458232609	D099 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K403

SECTION IV. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (CONTINUED) (RT-524, RT-524A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFZ	59458232609	D100 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-9	K405
PBOFZ	59458232609	D101 RELAY, ARMATURE: SAME AS D097		ea	1	*	*	*	*	5-16	K406
PBOFZ	59458232610	D211 RALAY, ARMATURE: SMC414125		ea	1	*	*	*	*	5-16	K404
PBOFD	38200577756	HANDLE ASSEMBLY, RIGHT-HAND (FOR RT-524/VRC MODEL ONLY)		EA	1	*	*	*	*	A,1-9	
PBOFD	38200890911	HANDLE ASSEMBLY, LEFT-HAND (FOR RT-524/VRC MODEL ONLY)		EA	1	*	*	*	*	A,1-9	
PBOZZ	53057640071	SCREW, MACHINE (SUBSTITUTE FOR HANDLE ASSEMBLIES CAPTIVE SCREWS)		EA	13	*	*	*	*		

SECTION V. INDEX-FEDERAL STOCK NUMBER AND REFERENCE NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (RT-524, RT-524A)

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
53302920618	C-14	A2MP2
5330442246 4	C-14	MP4
53550599188	C-14	1A300MP9
53556169659	C-14	1A300MP11
53556169659	C-14	1A300MP12
53556169659	C-14	1A300MP13
53556169659	C-14	1A300MP14
53558536353	C-14	1A300MP7
53558536384	C-14	1A300MP8
53558893424	C-14	1A300MP10
58200577756	A, 1-8, 1-9	
58208325506	C-14	1A300MP6
58200890911	A, 1-8, 1-9	
58208535957	C-8	1A3000A3100
58208535959	C-8	1A3000A3300
58208535960	C-11	1A5000A5100
58208535962	C-8	1A3000A3400
58208535963	C-9	1A4000A4100
58208535968	C-11	1A5000A5200
58208535969	C-8	1A3000A3700
58208535970	C-8	1A3000A3600
58208586463	C-8	1A3000A3200
5820-8586480	C-9	1A4000A4200
58208586483	C-4	1A3000E1
58208586498	C-16	1A2100A2101
58208592585	C-14	1A300A2
58208842476	C-10	1A8000A8200
58208842477	C-10	1A8000A8500
58208842478	C-10	1A8000A8300
58208842479	C-10	1A8000A8100
58208920622	C-2	1
58208984437	C-8	1A3000A3500
58209362577	C-9	1A4000A4300
58210899208	C-10	1A8000A8400
59158493466	C-9	1A4000FL4001
59158493467	C-9	1A4000FL4002
59158493468	C-11	1A5000A5300
59158923013	C-4	1FL401
59358230752	C-14	1A300A1
59458232609	5-16	K401, K402, K403, K406
59458232609	5-9	K405
59458232610	5-16	K404
59458535945	C-11	1A5000K5002
59458535946	C-11	1A5000K5001
59458536450	C-8	1A3000K3001
59958232599	C-4	1A300A1000A1001VR1001 TB1001W303
59958232600	C-4	1FL401W410
59958232603	C-4	1A8000A8300A83Q1W409
59958232608	C-4	1FL401W411
59958232934	C-4	1A6200A6100AR6101W407
59958232935	C-4	1A3000A3300A3301W403
59958232937	C-5	1A3000A3700A3701W404
59958536775	C-4	1A3000W202/W402
59998233249	C-10	1A8000E1
62108532180	C-14	1A300DS351MP2
62401557836	C-14	1A300DS352
62401557836	C-14	1A300DS352A

SECTION VII. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (R-442, R-442A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	58208920624	A001 RECEIVER, RADIO R-442/VRC, R-442A/VRC 80063; SMD414901	ea	1					C-3	
PBOFD	58208586483	A019 SHIELD PLATE ASSEMBLY: 80063; SMD413551	ea	1	*	*	*	*	C-6	E1
PBOFZ	59958536775	A047 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR4	ea	1	*	*	*	*	C-6	W202/W402
PBOFZ	59458535946	A061 ARMATURE, RELAY: 80063; SMD413526	ea	1	*	*	*	*	C-8	K3001
PBOFD	58208535975	A062 HARMONIC GENERATOR ASSEMBLY: 80063; SMB413559	ea	1	*	*	*	*	C8	A3100
PBOFD	58208586463	A098 AMPLIFIER, MIXER ASSEMBLY: 80063; SMB413592	ea	1	*	*	*	*	C-8	A3200
PBOFD	58208535959	A132 SECOND MIXER ASSEMBLY: 80063;SMB413611	ea	1	*	*	*	*	C-8	A3300
PBOFZ	59958536774	A149 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR2	ea	1	*	*	*	*	C-6	W203
PBOFD	58208535962	A169 AMPLIFIER, INTERMEDIATE FREQUENCY: 80063; SMB413634	ea	1	*	*	*	*	C-8	A3400
PBOFD	58208984437	A204 AMPLIFIER,LIMITER: 80063; SMB413650	ea	1	*	*	*	*	C-8	A3500
PBOFD	58208535970	A241 DISCRIMINATOR, ELECTRICAL FREQUENCY: 80063; SMB413670	ea	1	*	*	*	*	C-8	A3600
PBOFD	58208535969	A282 PHASE DISCRIMINATOR ASSEMBLY: 80063; SMB413699	ea	1	*	*	*	*	C-8	A3700
PBOFZ	59958536778	A305 CABLE ASSEMBLY, RADIO FREQUENCY: 80063; SMD414364-GR3	ea	1	*	*	*	*	C-6	W204
PBOFZ	59158493466	A378 FILTER, BAND PASS: 80063; SMD413719	ea	1	*	*	*	*	C-9	FL4001
PBOFZ	59158493467	A379 FILTER, BAND PASS: 80063; SMD413720	ea	1	*	*	*	*	C-9	FL4002
PBOFD	58208535963	A396 AMPLIFIER ASSEMBLY, INTERMEDIATE FREQUENCY: 80063; SMC413726	ea	1	*	*	*	*	C-9	A4100
PBOFD	58208586480	A443 DISCRIMINATOR, ELECTRICAL FREQUENCY: 80063; SMC413573	ea	1	*	*	*	*	C-9	A4200
PBOFD	58209362577	A536 AMPLIFIER, AUDIO FREQUENCY: 80063;SMB413785	ea	1	*	*	*	*	C-9	A4300
PBOFD	58208535960	A680 AMPLIFIER ASSEMBLY, AUDIO FREQUENCY: 80063; SMD413834	ea	1	*	*	*	*	C-11	A5100
PBOFD	58208535968	A730 AMPLIFIER, LIMITER: 80063; SMC413849	ea	1	*	*	*	*	C-11	A5200
PBOFD	59158493468	A791 SQUELCH ASSEMBLY: 80063; SMB413860	ea	1	*	*	*	*	C-11	A5300
PBOFZ	62104354780	B277 LIGHT, INDICATOR: 80063;SMC374827-1	ea	1	*	*	*	*	C-15	DS101
PBOFZ	58208592585	B376 CAP ASSEMBLY: 80063; SMB414407	ea	1	*	*	*	*	C-15	MP1
PBOFZ	53302920618	B379 PACKING, PREFORMED: 88044; AN6227-7	ea	1	*	*	*	*	C-15	MP1MP3
PBOZZ	53556169659	B380 KNOB: 96906; MS91525-1	ea	1	*	*	*	*	C-15	MP2
PBOZZ	53556199659	B381 KNOB: SAME AS B380	ea	1	*	*	*	*	C-15	MP3
PBOZZ	53558536353	B382 KNOB: 80063; SMC414393	ea	1	*	*	*	*	C-15	MP4
PBOZZ	53558536384	B383 KNOB: 80063; SMC414399	ea	1	*	*	*	*	C-15	MP5

SECTION VII REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (CONTINUED) (R-442, R-442A)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOZZ	53550599188	B384 KNOB: 80063; SMC414401		ea	1	*	*	*	*	C-15	MP6
PBOZZ	5355889[illegible]424	B385 KNOB: 80063; SMD447052		ea	1	*	*	*	*	C-15	MP7
PBOZZ	62401557836	B386 LAMP, INCANDESCENT: 96906; MS25237-327		ea	1	*	*	*	*	C-15	DS101
PBOZZ	62401557836	B387 LAMP, INCANDESCENT: SAME AS B386		ea	1	*	*	*	*	C-15	DS102
PBOFZ	53304422464	B554 GASKET: 80063; SMB414511		ea	1	*	*	*	*		ALMP2
PBOFZ	582085864[illegible]98	B663 REGULATOR, VOLTAGE: 80063: SMD414157		ea	1	*	*	*	*	C-16	A2101
PBOZZ	59458535946	ARMATURE, RELAY 80063, SMD414823		EA	1	*	*	*	*	C-11	1A5000K5002
PBOZZ	59458535945	ARMATURE, RELAY 80063, SMC414824		EA	1	*	*	*	*	C-11	1A5000K5001

SECTION VII. INDEX-FEDERAL STOCK NUMBER AND REFERENCE NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (R-442, R-442A)

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
53302920618	C-15	1A100MP1MP3
53550599188	C-15	1A100MP6
53556169659	C-15	1A100MP2
53556169659	C-15	1A100MP3
53558536353	C-15	1A100MP4
53558536384	C-15	1A100MP5
53558893424	C-15	1A100MP7
58208535959	C-8	1A3000A3300
58208535960	C-11	1A5000A5100
58208535962	C-8	1A3000A3400
58208535963	C-9	1A4000A4100
58208535968	C-11	1A5000A5200
58208535969	C-8	1A3000A3700
58208535970	C-8	1A3000A3600
58208535975	C-8	1A3000A3100
58208586463	C-8	1A3000A3200
58208586480	C-9	1A4000A4200
58208586483	C-6	1A3000E1
58208586498	C-16	1A2100A2101
58208592585	C-15	1A100MP1
58208920624	C-3	1
58208984437	C-8	1A3000A3500
58209362577	C-9	1A4000A4300
59158493466	C-9	1A4000FI4001
59158493467	C-9	1A4000FI4001
59158493468	C-11	1A5000A5300
59458533945	C-11	1A5000K5001
59458535946	C-8	1A3000K3001
59458533946	C-11	1A5000K5002
59958536774	C-6	1A3000A3300A3301W203
59958536775	C-6	1A3000W202/W402
59958536778	C-6	1A3000A3700A3701W204
62104354780	C-15	1A100DS101MP
62401557836	C-15	1A100DS101
62401557836	C-15	1A100DS102

SECTION IX. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (AT-912/VRC)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	58208976357	ANTENNA AT-912/VRC: 80063; SM-D-415338	ea						1-12	
PBOZZ	58208562728	ANTENNA ELEMENT AT-1095/VRC: 80063; SC-DL-415505	ea	1	*	*	*	*	1-12	
PBOFD	58208562730	ANTENNA ELEMENT AT-1096/VRC: 80063; SM-DL-415380	ea	1	*	*	*	*	1-12	
PBOZZ	58209086416	ANTENNA TIE-DOWN ASSEMBLY: 80063; SM-C-208747	ea	1	*	*	*	*	1-12	
PBOZZ	58204372353	ANTENNA TIP CAP 80063, SCC446180	EA	1	*	*	*	*	1-12	

SECTION IX. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (C-2299/VRC)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	58208923340	CONTROL, RADIO SET C-2299/VRC: 80063; SC-DL-415185							1-17	
PBOZZ	59359333752	COVER, DUST: 80063;SMB104328	ea	2	*	*	*	*	2-16	
PBOZZ	53558536384	KNOB: 80063; SMC414399	ea	1	*	*	*	*	1-17	
PBOZZ	53556561358	KNOB: 96906; MS91525-2	ea	1	*	*	*	*	1-17	

SECTION XI. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (C-2742/VRC)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	5820923343	CONTROL, FREQUENCY SELECTOR C-2742/VRC: 80063; SC-DL-415150								1-18	
PBOZZ	59359333752	COVER, DUST		ea	2	*	*	*	*	2-16	MP11
PBOZZ	6240155783 6	LAMP, INCANDESCENT: 96906; MS25237-327		ea	1	*	*	*	*		MP10
PBOZZ	53556675889	KNOB: 80063; SMD415160		ea	1	*	*	*	*	1-18	MP5
PBOZZ	53356561358	KNOB: 80063; SMD415161		ea	1	*	*	*	*	1-18	MP6

SECTION XI. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (MT-1029/VRC)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PAOFD	58208931323	MOUNTING MT-1029/VRC: 80063; SM-DL-414975							2-7	
PBOZZ	59359112323	COVER, ELECTRICAL CONNECTOR:	ea	1	*	*	*	*	2-7	
PBOZZ	59359333752	COVER, DUST: 80063; SMB104328	ea	3	*	*	*	*	2-16	
PBOZZ	59954261123	WIRE, BRAIDED 80063, SMB415072	EA	2	*	*	*	*	2-9	GND STRAP

SECTION XIII REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE (MT-1898/VRC)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Reference Number & Mfr Code USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PBOFD	5820931324	MOUNTING MT-1898/VRC: 80063; SC-DL-415050							2-8	
PBOZZ	59359112323	COVER, ELECTRICAL CONNECTOR	ea	1	*	*	*	*	2-7	
PBOZZ	59359333752	COVER, DUST 80063; SMB104328	ea	3	*	*	*	*	2-16	
PBOZZ	59954261123	WIRE, BRAIDED 80063, SMB415072	EA	1	*	*	*	*	2-8	GND STRAP

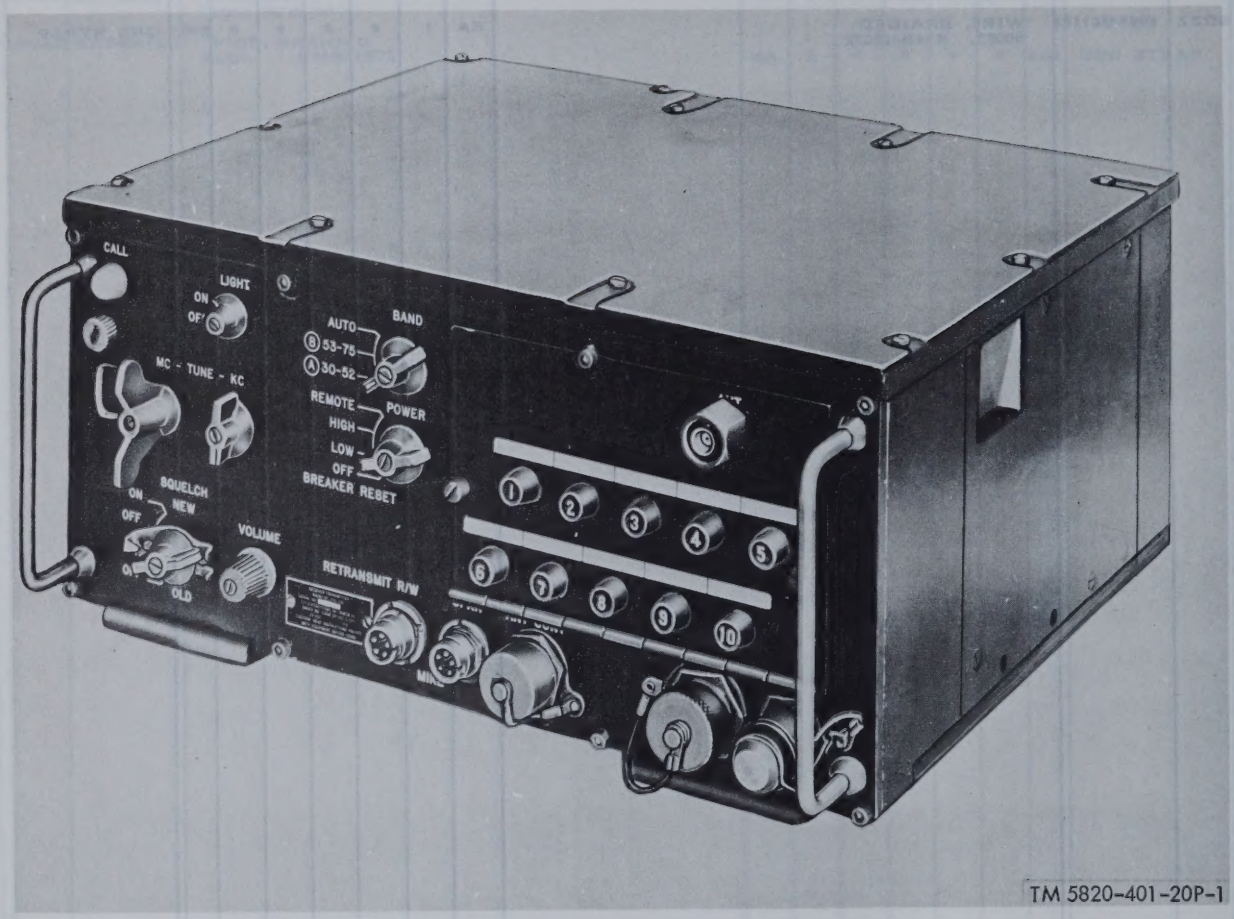


Figure C-1. Receiver-Transmitter, Radio RT-246A/VRC.

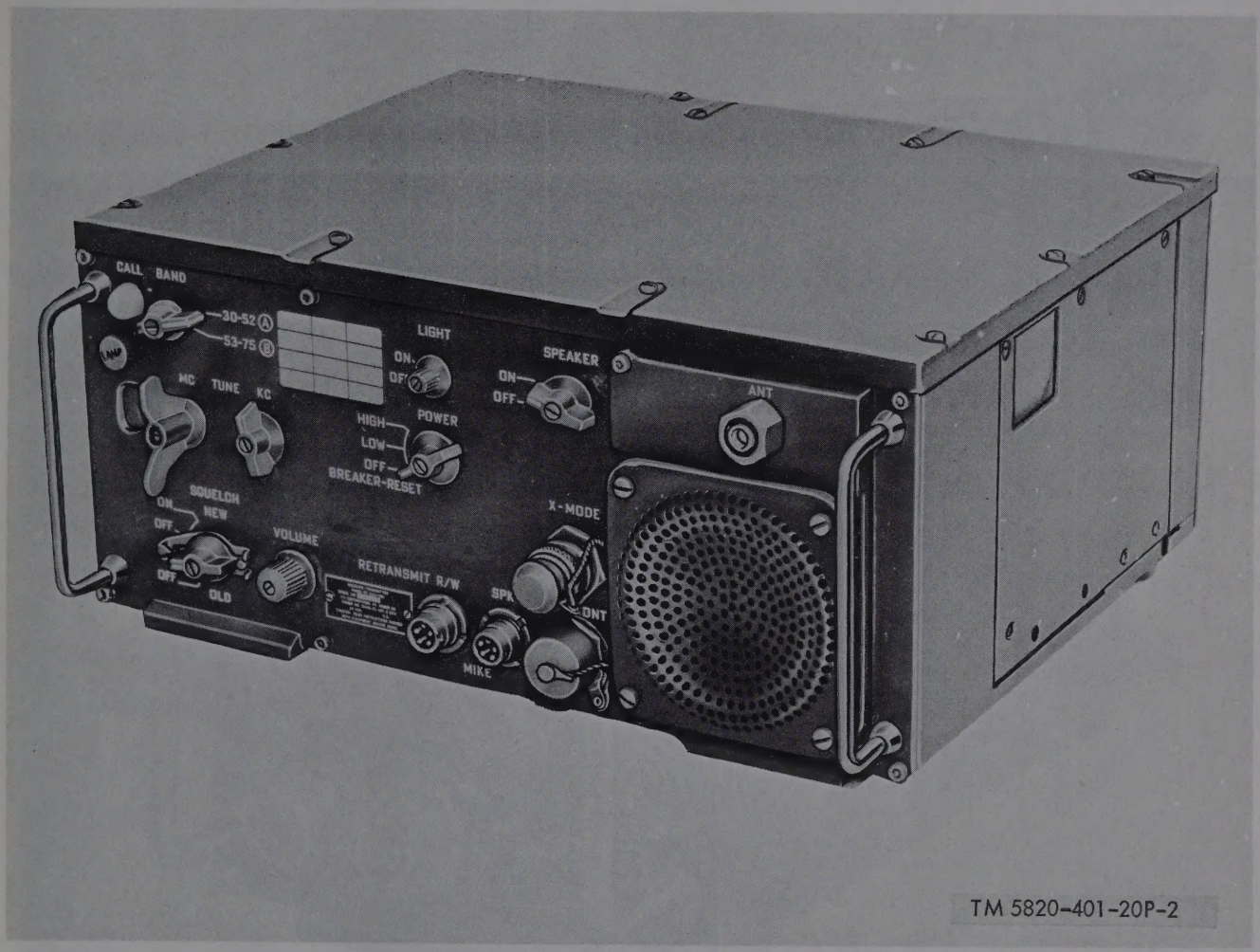


Figure C–2. Receiver-Transmitter, Radio RT–524A/VRC.

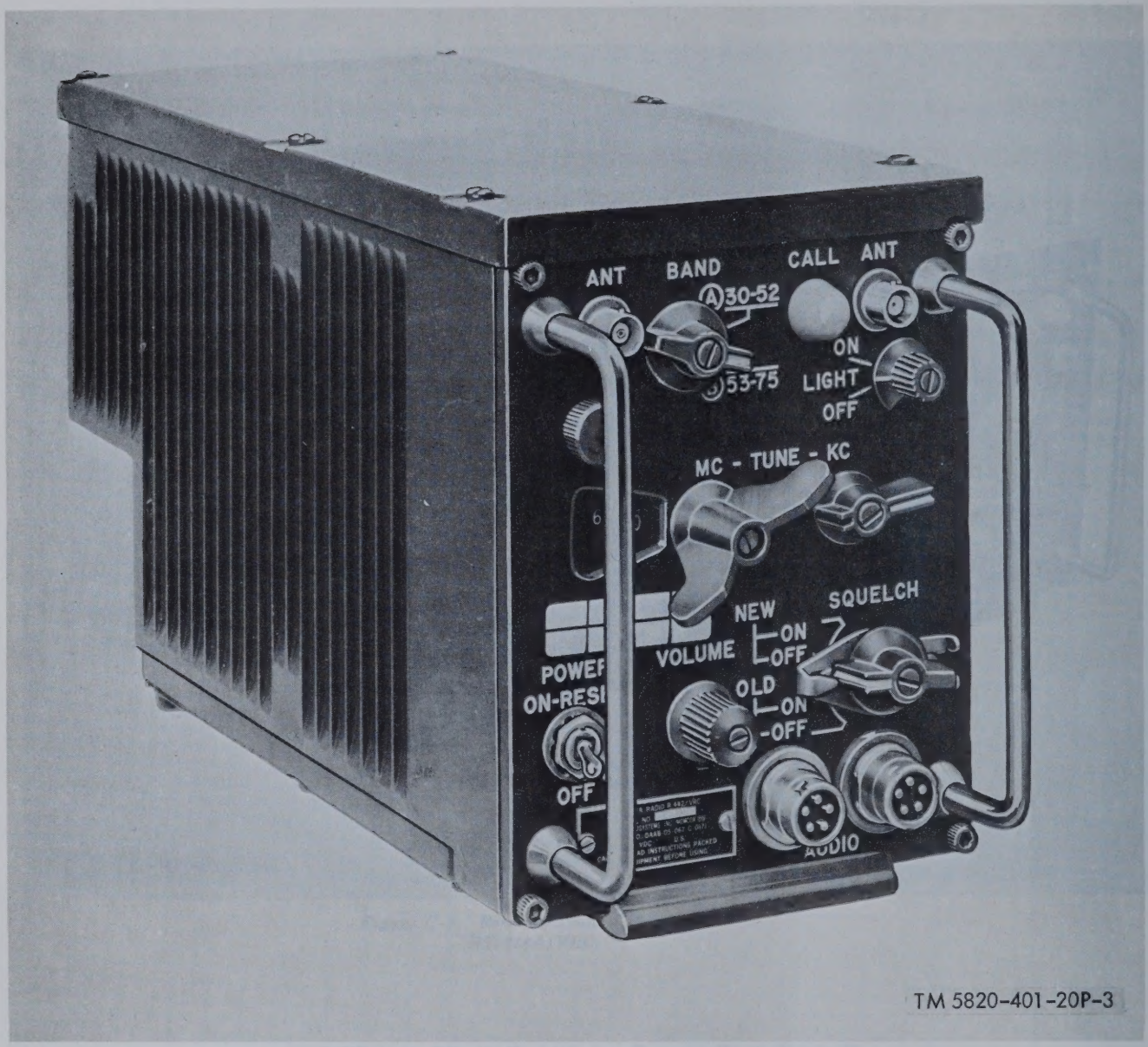


Figure C-3. Receiver, Radio R-442(*)/VRC.

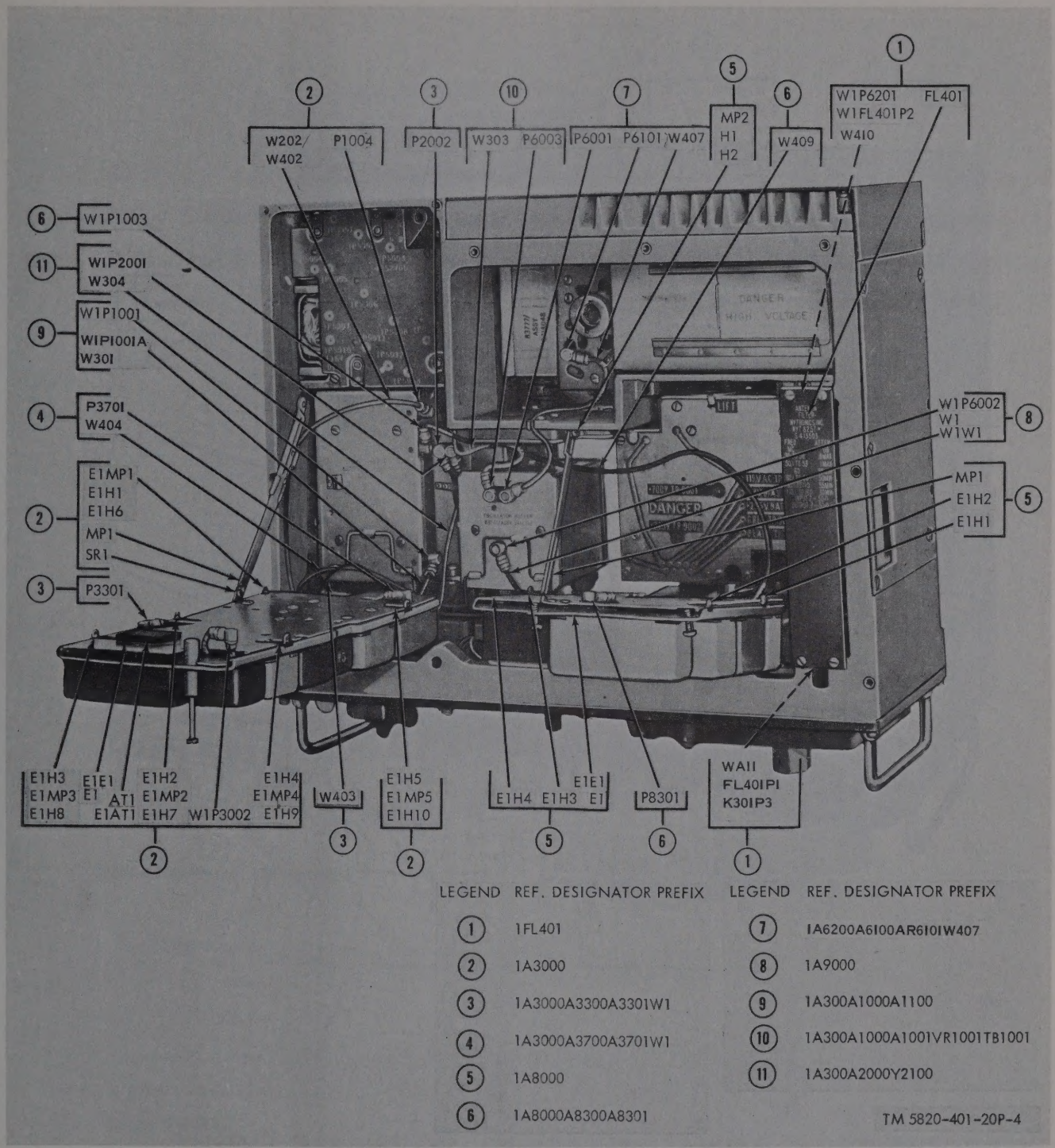


Figure C-4. Receiver-transmitter; top view; assemblies A3000 and A8000 lowered; repair parts location.

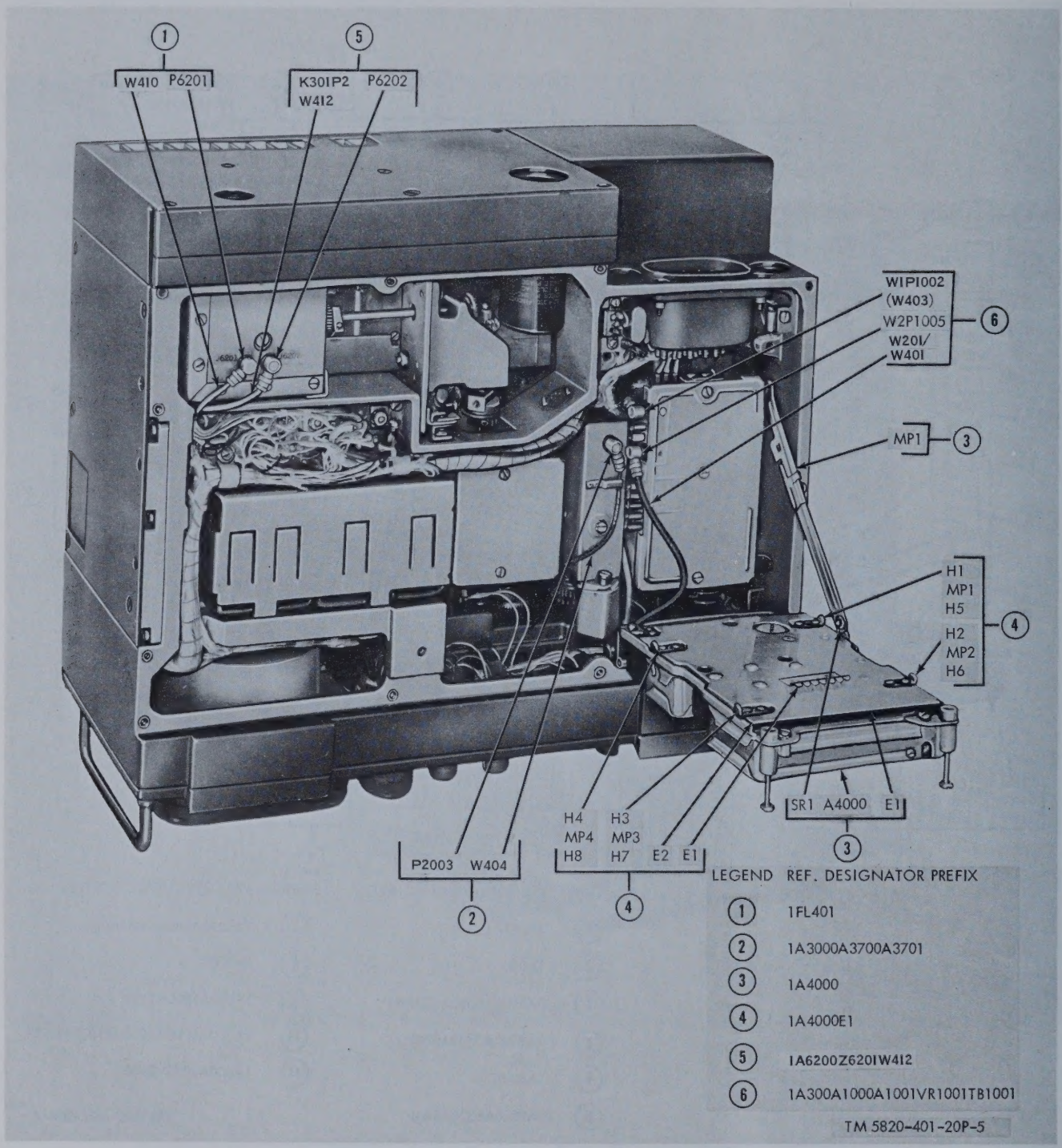


Figure C-5. Receiver-transmitter, bottom view; assembly A4000 lowered; repair parts location.

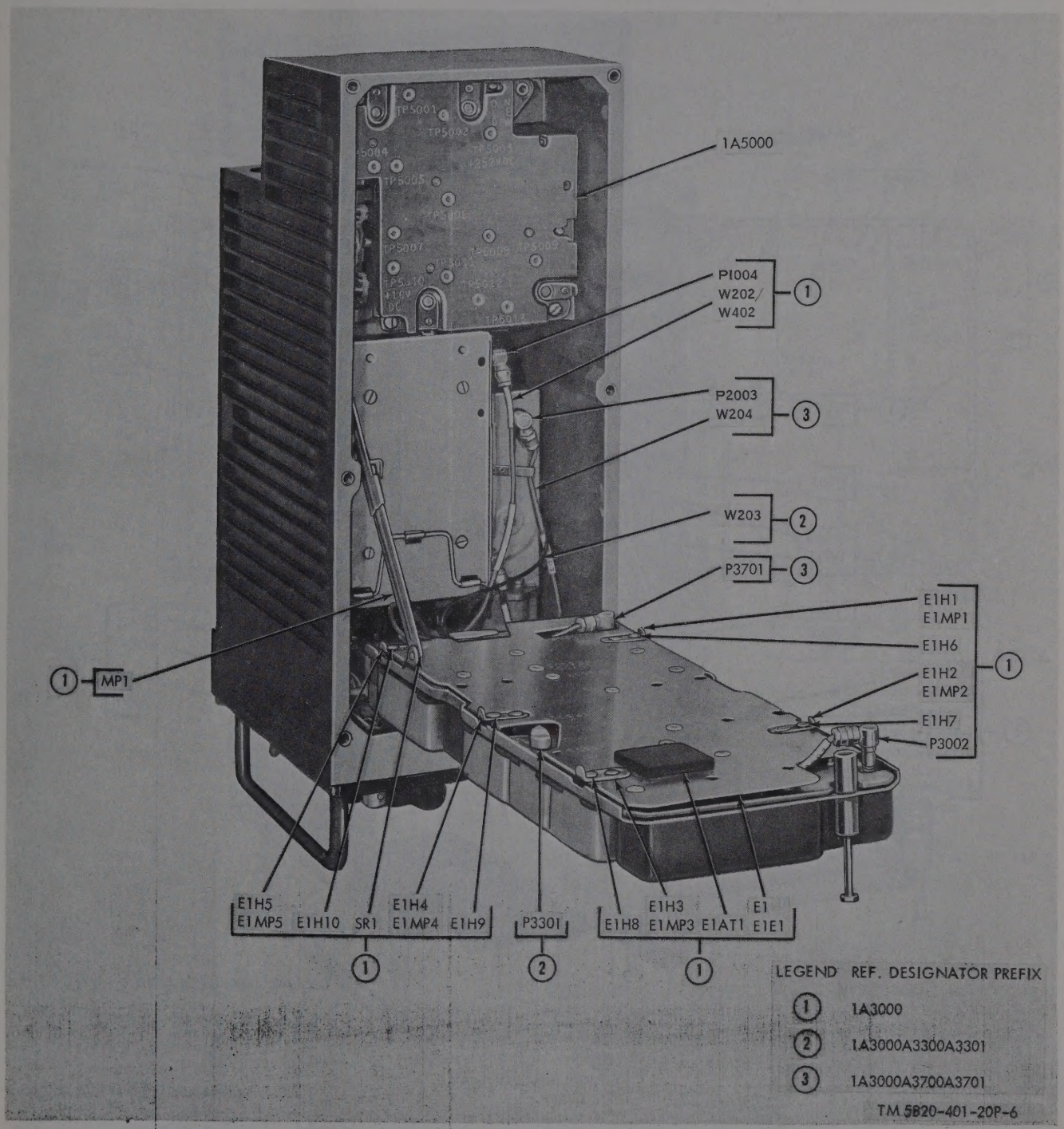


Figure C-6. Receiver, Radio R-442(*)/VRC, top view; assembly A3000 lowered; repair parts location.

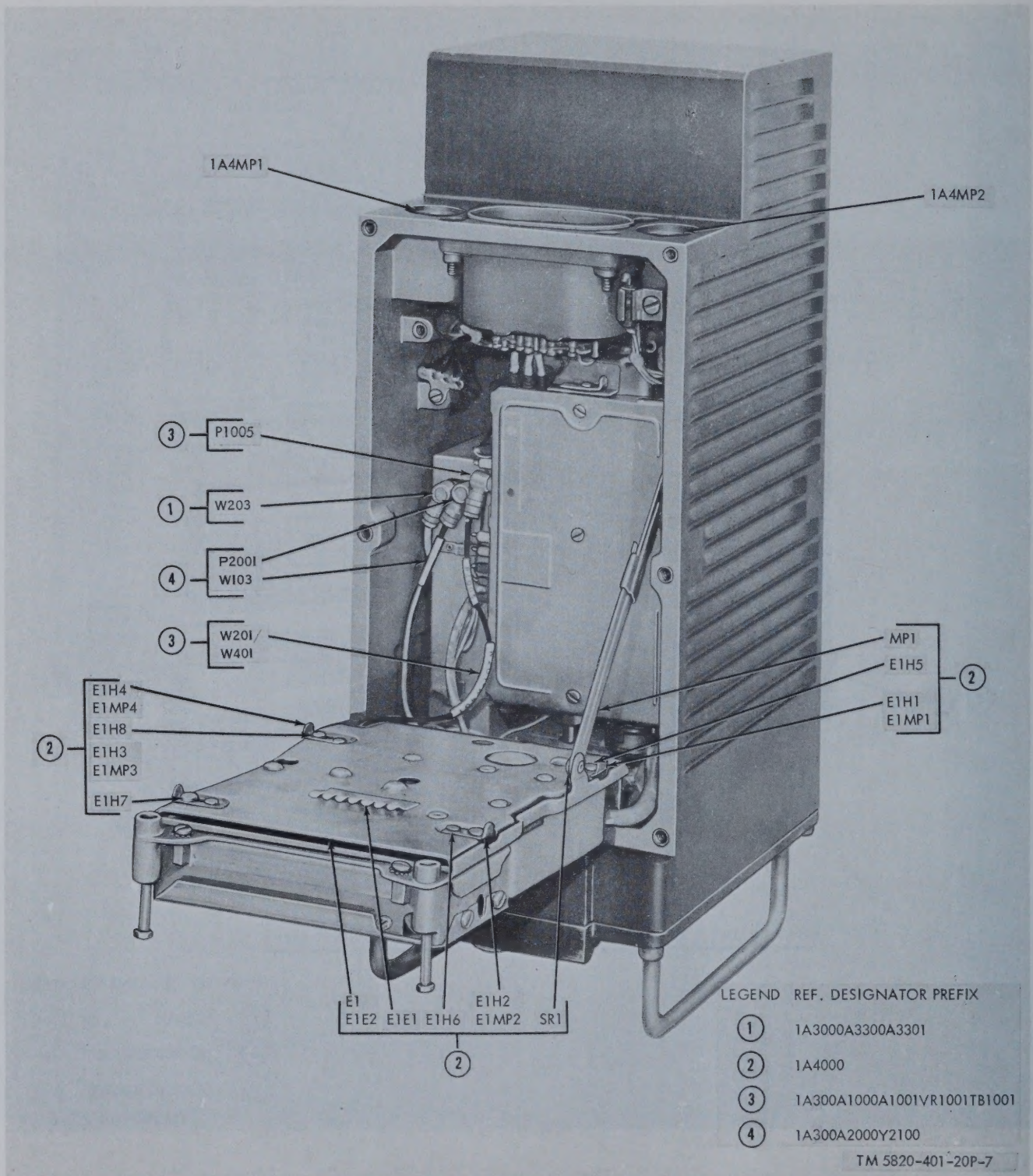


Figure C-7. Receiver, Radio R-442(*)/VRC, bottom view; assembly A4000 lowered; repair parts location.

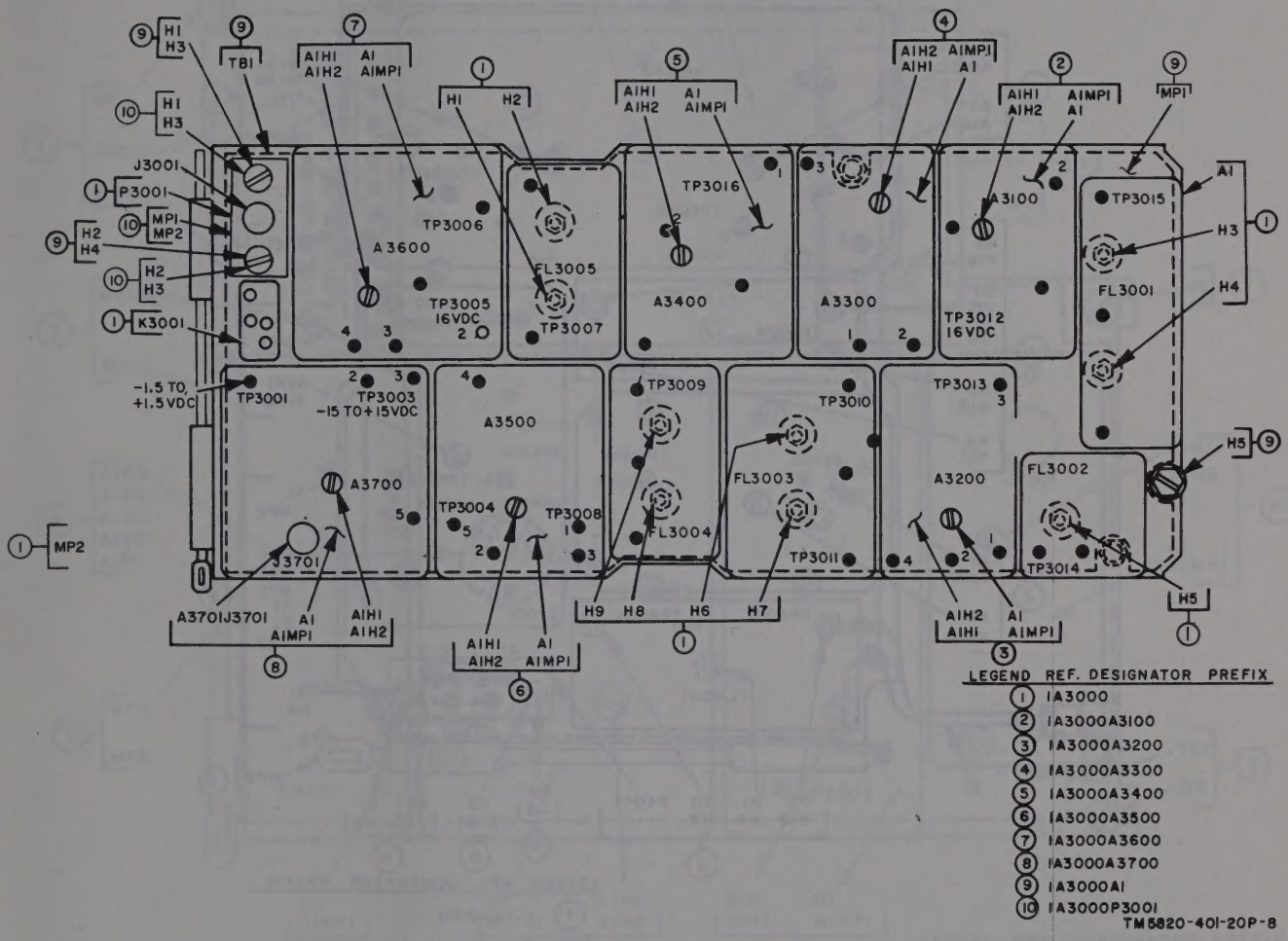


Figure C–8. Crystal reference system assembly A3000 (part of receiver-transmitters and R–442(*)/VRC); repair parts location.

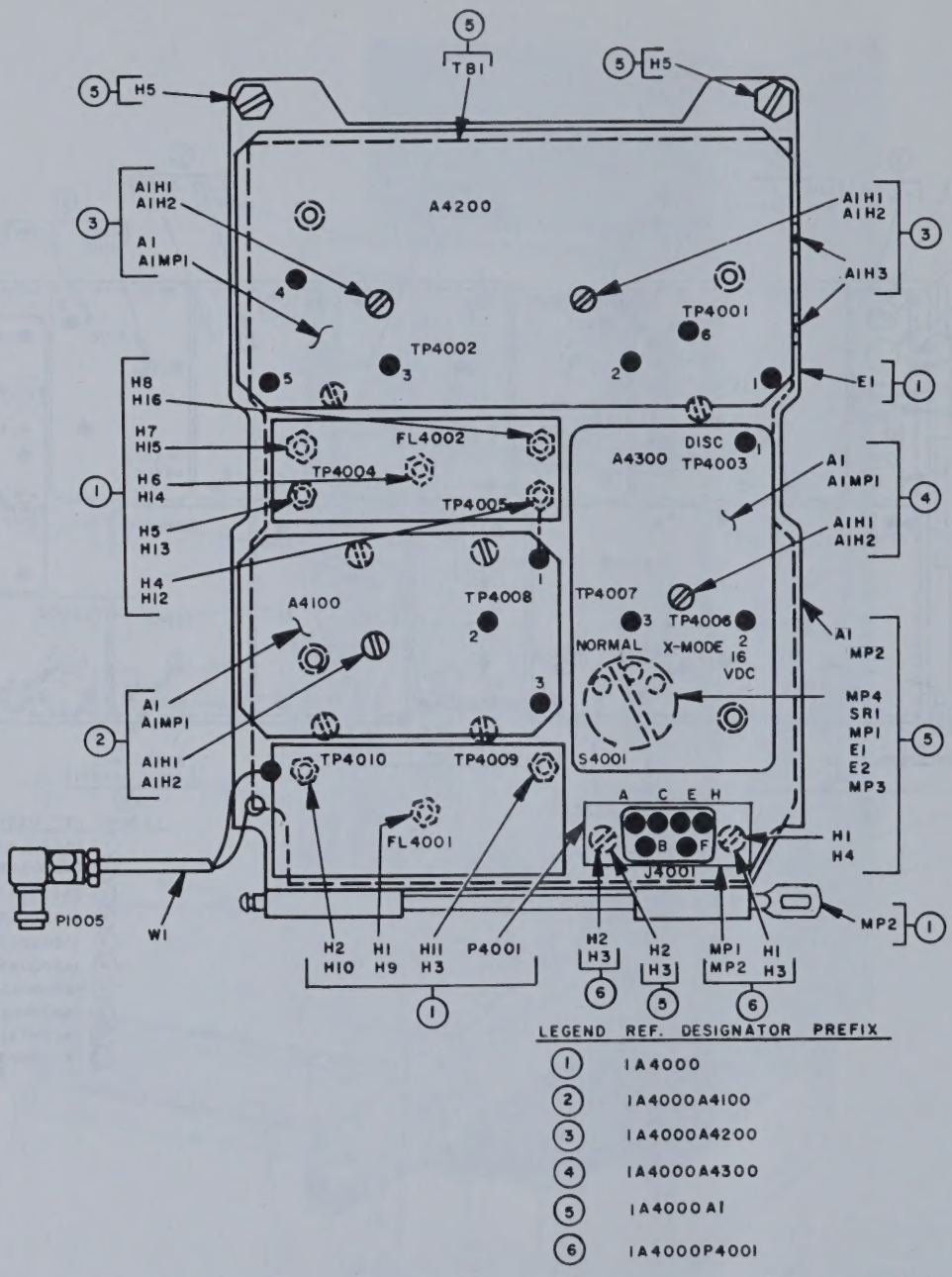


Figure C-9. Amplifier assembly, intermediate frequency assembly A4000 (part of receiver-transmitters and R-442(*)/VRC); repair parts location.

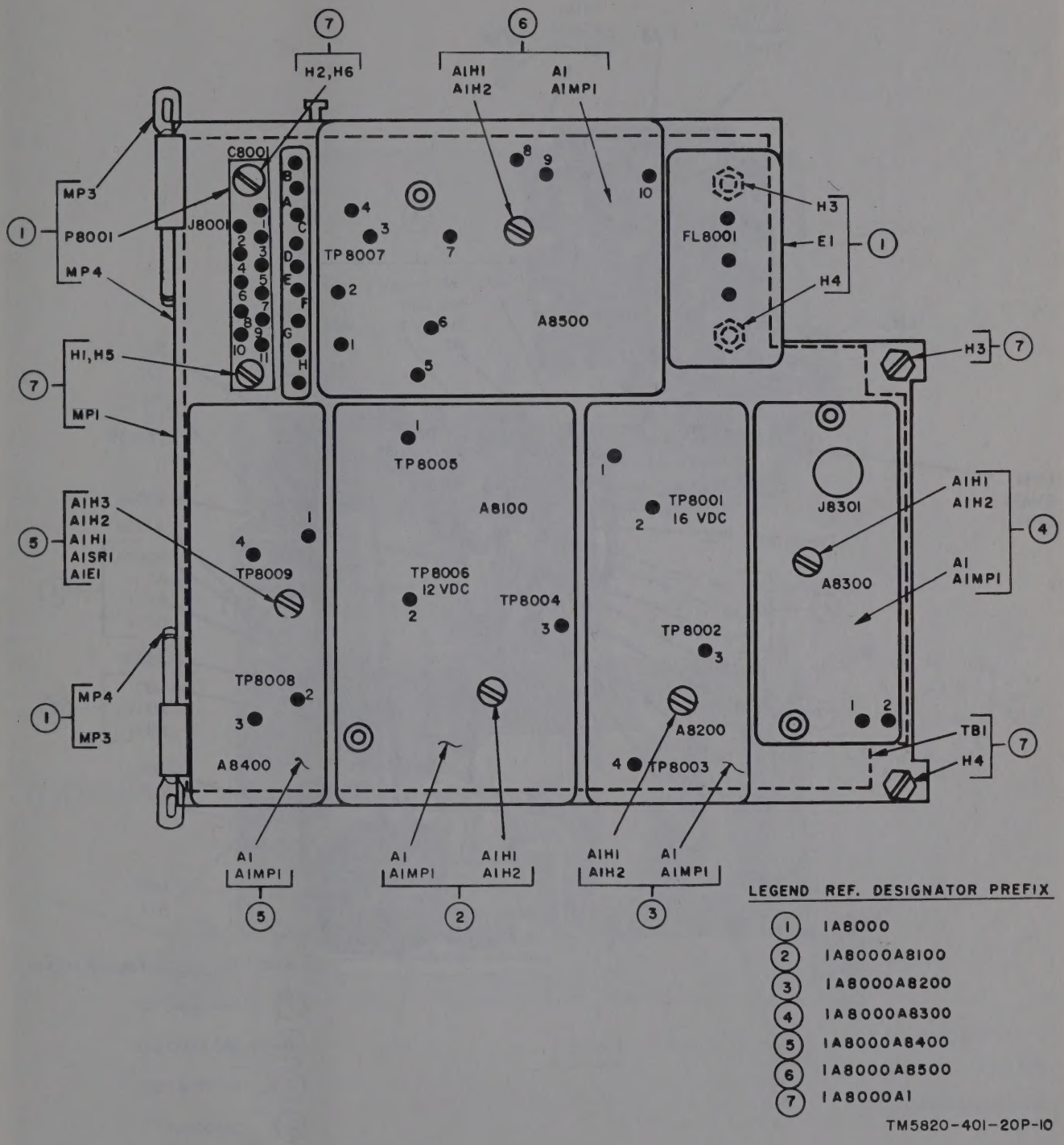


Figure C–10. Amplifier, modulator assembly A8000 (part of receiver-transmitters); repair parts location.

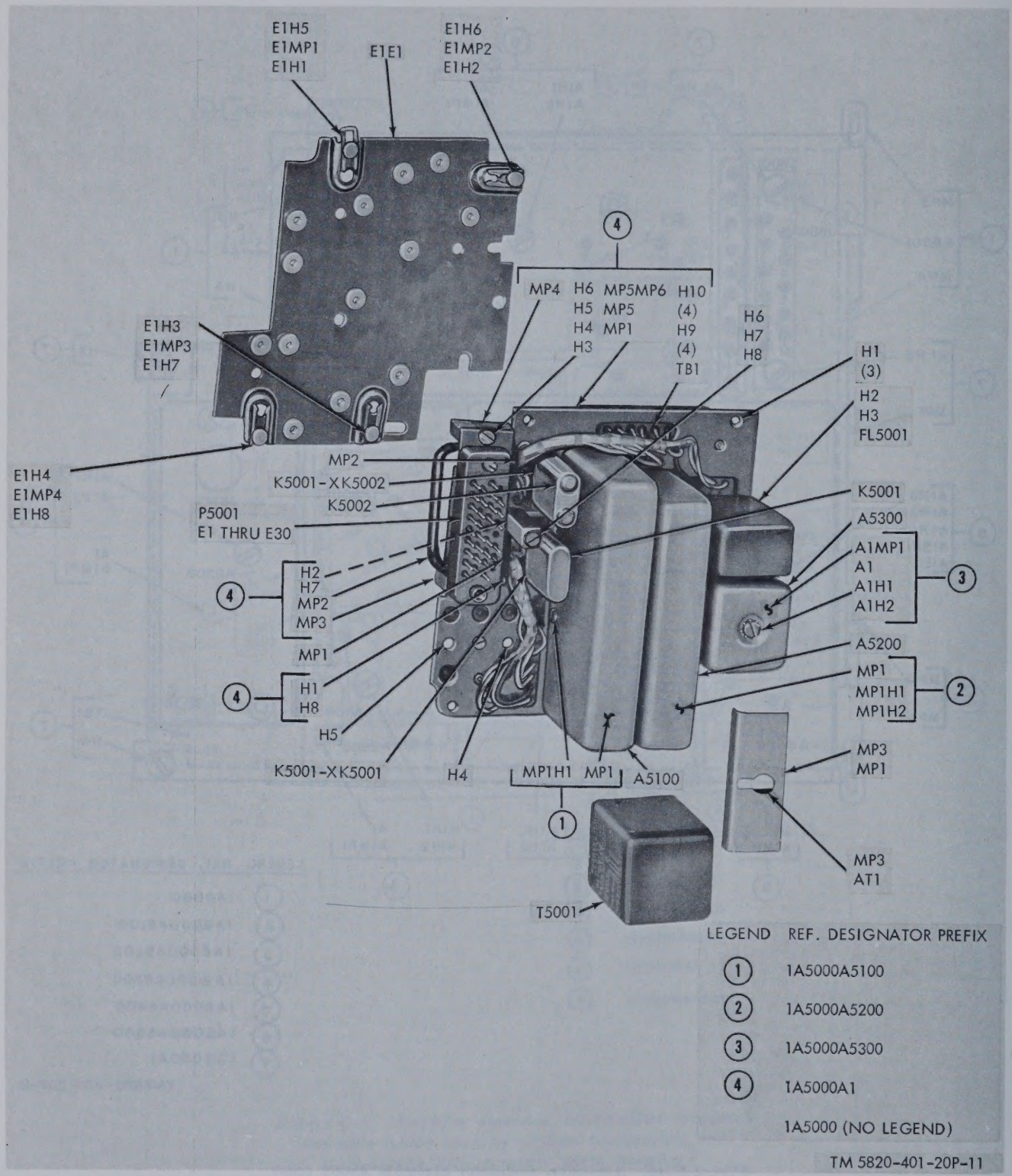


Figure C-11. Amplifier assembly, intermediate frequency assembly A5000 (part of receiver-transmitters and R-442(*)/VRC); repair parts location.

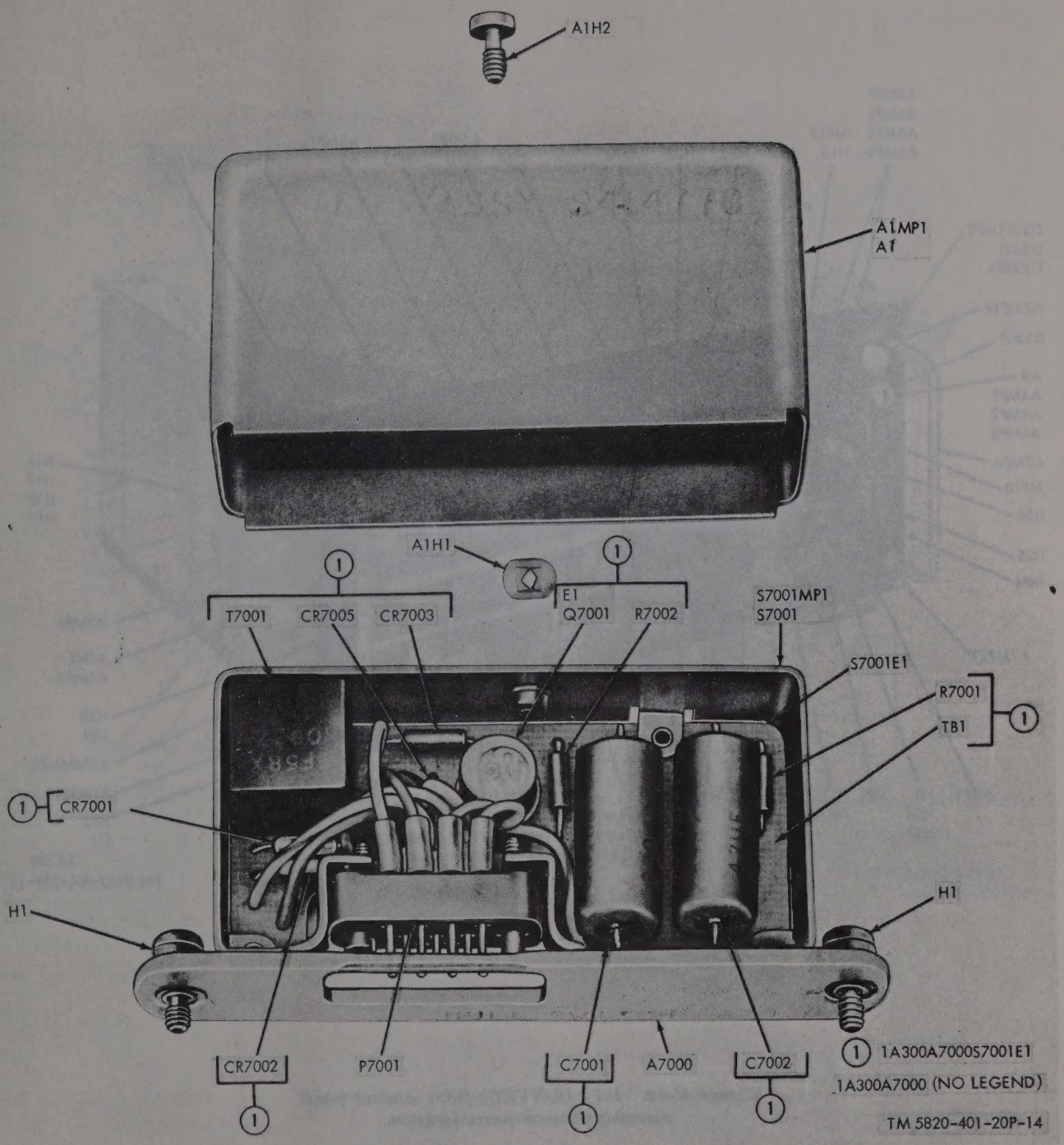


Figure C-12. Switch, null assembly A7000 (part of RT-246(*)/VRC); repair parts location.

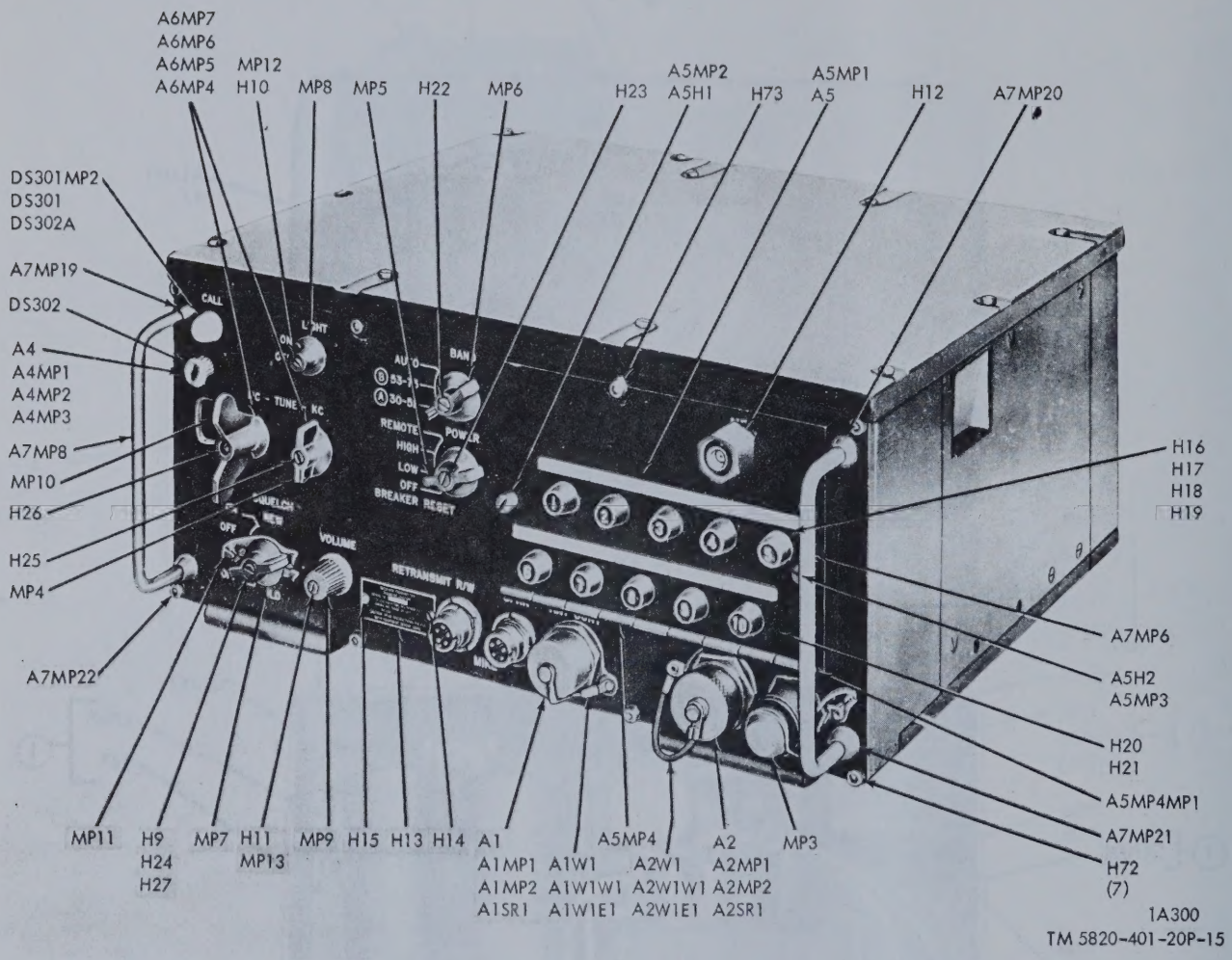


Figure C-13. RT-246A/VRC, front control panel assembly; repair parts location.

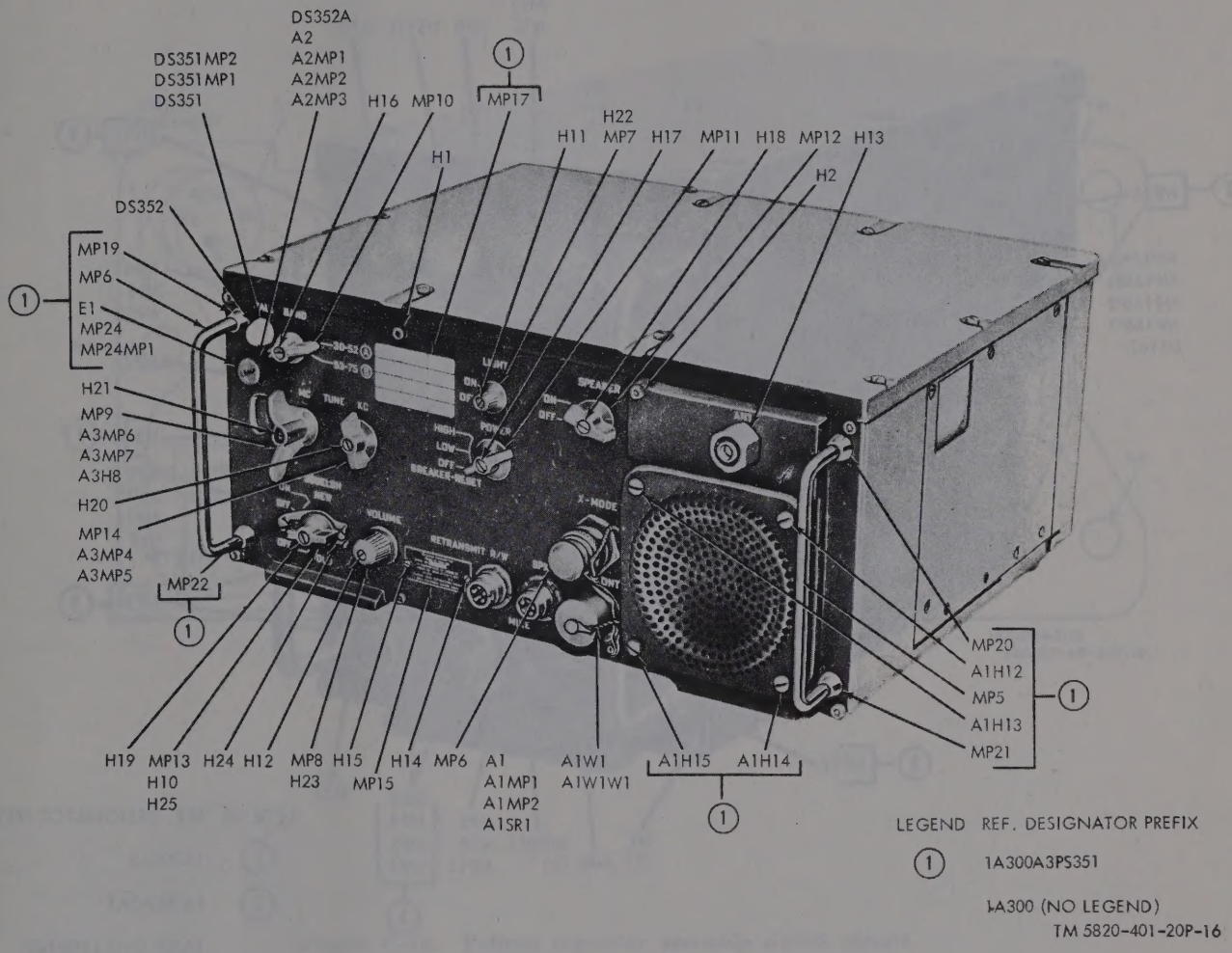


Figure C–14. RT–524A/VRC, front control panel assembly; repair parts location.

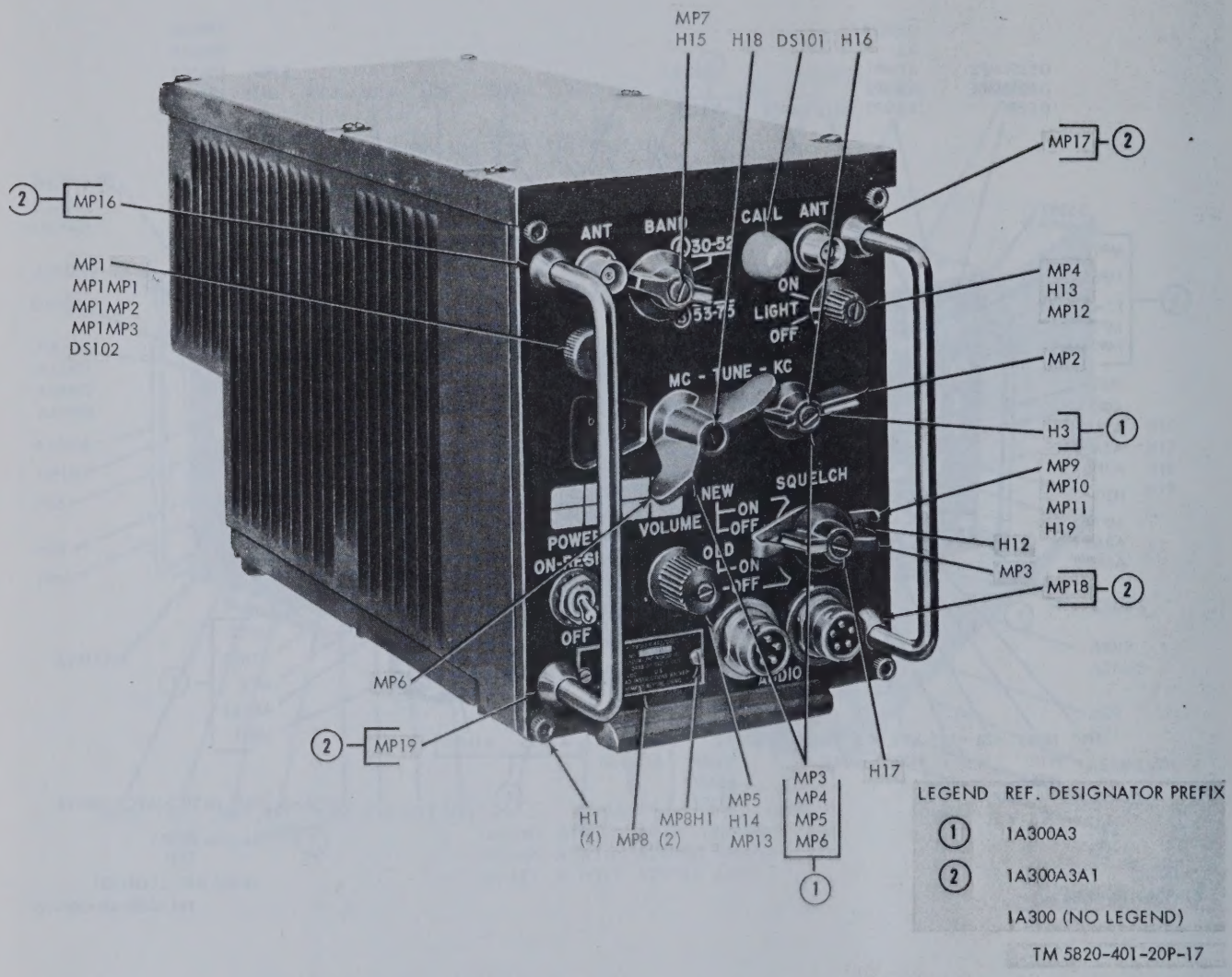


Figure C-15. R-442(*)/VRC, front control panel assembly; repair parts location.

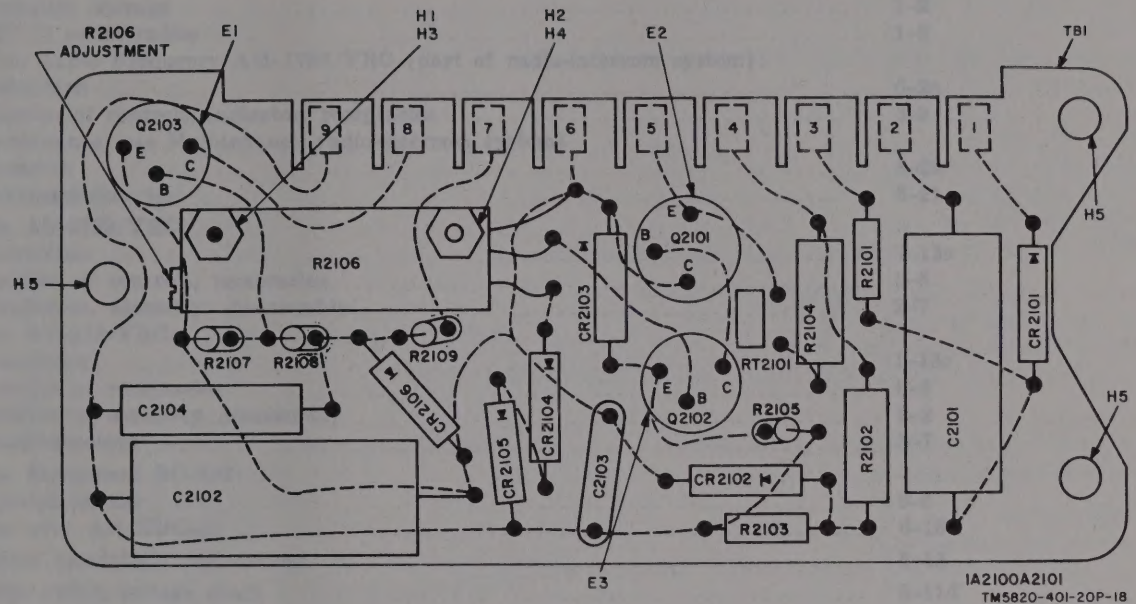


Figure C-16. Voltage regulator assembly A2100, circuit card assembly A2101 (part of receiver-transmitters and R-442(*)/VRC); repair parts location.

INDEX

	Paragraph or table	Page
Accessory Kit MX–1137/GRA–12, installation and use	6–17	6–27
Administrative storage	1–2	1–2
AN/VRC–12 series radios	1–9	1–11
Amplifier, Audio Frequency AM–1780/VRC (part of radio-intercom system):		
Description	6–2*a*	6–1
Function of controls, indicator, receptacles	3–9	3–9
Maintenance (*see* Maintenance, radio-intercom system)		
Operation	3–20	3–26
Retransmission use	3–21	3–29
Antenna AS–1729/VRC:		
Description	1–13*c*	1–16
Function of controls, receptacles	3–5	3–7
Installation, assembly, disassembly	2–7	2–5
Antenna AT–912/VRC:		
Description	1–13*c*	1–16
Function of receptacles	3–6	3–7
Installation, assembly, disassembly	2–8	2–9
Troubleshooting	5–7	5–7
Antenna Equipment RC–292:		
Description, use	6–6	6–3
Use with AN/VRC–55	6–16*c*	6–25
Assemblies (modules), replacement	5–13	5–24
Assembly A9000, voltage chart	5–11*d*	5–21
Audio accessories:		
Description	6–3	6–2
Connections, use of	3–15	3–16
Cable assemblies:		
Installaton, removal:		
General instructions	3–13	2–22
Power cables, CX–4720/VRC, CX–4721/VRC	2–11	2–18
Module interconnecting cables	5–13*g*	5–41
Used with radios, radio-intercom system	6–4	6–2
Cleaning:		
Equipment	4–3	4–5
Heat exchanger	5–5	5–6
Common names	1–1*c*	1–1
Components of equipment:		
AN/VIC–1(V)	6–2	6–1
AN/VRC–12 series radios	1–9*a*	1–11
AN/VRC–54	6–11	6–18
AN/VRC–55	6–16	6–25
AS–1729/VRC	1–9*b*	1–12
AT–912/VRC	1–9*c*	1–14
C–2299/VRC	1–10*c*	1–14
C–2742/VRC	1–10*d*	1–14
MT–1029/VRC	1–10*a*	1–14
MT–1898/VRC	1–10*b*	1–14
Conditions for using squelch mode operation	3–16	3–23
Connections and use of audio accessories	3–15	3–16
Control, Frequency Selector C–2742/VRC:		
Description	1–14*c*	1–19
Function of controls indicators, receptacles	3–13	3–14
Operation with RT–246(*)/VRC	3–18	3–25
Maintenance (*see* Maintenance, radio system).		

	Paragraph or table	Page
Control, Intercommunication Set C-2296/VRC:		
Description	6-2*b*	6-1
Function of controls, receptacles	3-10	3-11
Operation	3-20	3-26
Maintenance (*see* Maintenance, radio-intercom system).		
Controls, Intercommunication Set C-2297/VRC and C-2298/VRC:		
Description	6-2*c*	6-1
Function of controls, indicators, receptacles	3-11	3-11
Operation	3-20	3-26
Maintenance (*see* Maintenance, radio-intercom system).		
Control, Radio Set C-2299/VRC:		
Description	1-14*b*	1-19
Function of controls, receptacles	3-12	3-13
Retransmission operation:		
With AN/VRC-54	6-13*b*(5)	6-22
With AN/VRC-55	6-18*b*(4)	6-27
With receiver-transmitters and radio intercom system	3-21	3-29
Description of equipment (*see* individual equipment)		
Desert and dusty area operation	3-23	3-30
Destruction to prevent enemy use	1-3	1-2
Differences in models of receiver-transmitters and Receiver R-442(*)/VRC	1-12	1-15
Emergency operation	3-24	3-31
Equipment performance requirements (radio system)	5-8	5-9
Equipment serviceability criteria	1-4	1-2
Fm compatible radios	1-7*a*	1-3
Frequency selection, interference	2-2	2-1
Function of controls, indicators, receptacles (*see* individual equipment)		
General cabling instructions	2-13	2-22
General operating instructions	3-14	3-15
Handling radios:		
Receiver R-442(*)/VRC	2-6	2-4
Receiver-transmitters	2-5	2-3
Heat exchanger cleaning	5-5	5-6
Installations, non-vehicular	2-4	2-2
Installing equipment (*see* individual equipment).		
Intercommunication Set AN/VIC-1(V) (see also radio-intercom system)	6-2	6-1
Interfering frequencies, solution to	2-2*b*	2-1
Items required to make radio sets operational	1-11	1-14
Jamming recognition	3-22	3-30
Junction Box J-1014/VRC, use, installation	6-17	6-27
Links of radio mounts, changing	2-10*b*	2-13
Lubricants, use of	5-3	5-5
Maintenance forms and records	1-2	1-2
Maintenance procedures:		
Equipment performance requirements (radio system)	5-8	5-9
Operator's:		
Preventive:		
AN/VRC-54	Tables 6-1, 6-2	6-24
AN/VRC-55	Tables 6-5, 6-6	6-30, 6-31
Radio and radio-intercom systems:		
Daily	Table 4-1	4-1
Weekly	Table 4-2	4-3

	Paragraph or table	Page
Maintenance procedures—Continued		
Troubleshooting:		
AN/VRC-54	6-14	6-22
AN/VRC-55	6-19	6-30
Radio-intercom system	4-6	4-9
Radio system	4-5	4-6
Visual inspection	4-4	4-4
Organizational:		
Preventive:		
AN/VRC-54	Tables 6-3, 6-4	6-24
AN/VRC-55	Tables 6-7, 6-8	6-31
Radio and radio-intercom systems, quarterly	Table 5-1	
Troubleshooting:		
AN/VRC-54	6-15	6-25
AN/VRC-55	6-20	6-31
Radio-intercom system	5-10	5-17
Radio system	5-9	5-13
Receiver-transmitters and R-442(*)/VRC	5-11	5-18
Using TS-2609/U	5-7	5-7
Visual inspection	4-4	4-5
Repairs:		
General module replacement procedures	5-12	5-22
Module-interconnecting cables	5-13*g*	5-41
Receiver R-442(*)/VRC	5-14	5-43
Receiver-transmitters	5-13	5-24
Mast bases; Receiver R-442(*)/VRC, installation, removal	2-9*d*	2-10
Module-interconnecting cables, removal and replacement	5-13*g*	5-41
Module replacement procedures:		
General	5-12	5-22
Receiver R-442(*)/VRC	5-14	5-43
Receiver-transmitters	5-13	5-24
Mountings MT-1029/VRC and MT-1898/VRC:		
Changing power control links	2-10*b*	2-13
Description	1-14*a*	1-16
Function of receptacles, link:		
MT-1029/VRC	3-7	3-8
MT-1898/VRC	3-8	3-8
Installation	2-10	2-11
Troubleshooting:		
Operator's	4-5	4-6
Organizational	5-9	5-13
Non-vehicular installations	2-4	2-2
Operating procedures (*see* individual equipment; *see* radio system; *see* radio-intercom system).		
Operator maintenance (*see* Maintenance, operator's).		
Organizational maintenance (*see* Maintenance, organizational).		
Oscillator O-574/GRA	6-9	6-8
Painting	5-4	5-5
Parts removal, replacement:		
Receiver R-442(*)/VRC	5-14	5-43
Receiver-transmitters	5-13	5-24
Performance requirements for radio system	5-8	5-9
Power cables CX-4720/VRC, CX-4721/VRC	2-11	2-18
Power control links of radio mounts, changing	2-10*b*	2-13
Power Supply PP-2953(*)/U:		
Description	6-5	6-3
Use	2-4	2-2
Purpose and use of AN/VRC-12 series radios	1-6	1-2

	Paragraph or table	Page
Radio-intercom system:		
Cables used with	6-4	6-2
Cabling diagrams	2-13*c*	2-27
Component removal, replacement	2-12	2-20
Description of AN/VIC-1(V)	6-2	6-1
Function of controls, indicators, receptacles:		
AM-1780/VRC	3-9	3-9
C-2296/VRC	3-10	3-11
C-2297/VRC	3-11	3-11
C-2298/VRC	3-11	3-11
Maintenance (*see* Maintenance, radio-intercom system).		
Troubleshooting (*see* Maintenance, radio-intercom system).		
Radio mounts (see Mountings MT-1029/VRC, MT-1898/VRC).		
Radio Sets, AN/VRC-12 series radios (*see* radio system).		
Radio Set AN/GRC-19 (*see* Radio Set AN/VRC-55).		
Radio Set AN/PRC-25 (*see* Radio Set AN/VRC-54).		
Radio Set AN/VRC-24(*) (*see* Radio Set AN/VRC-54).		
Radio Set AN/VRC-54:		
General characteristics, components	6-11	6-18
Installation	6-12	6-19
Operation and retransmission (AN/VRC-46, AN/VRC-24(*), AN/PRC-25)	6-13	6-19
Maintenance:		
Operator's	6-14	6-22
Organizational	6-15	6-25
Radio Set AN/VRC-55:		
General characteristics, components	6-16	6-25
Installation (J-1014/VRC)	6-17	6-27
Operation and retransmission (AN/GRC-19, AN/VRC-46)	6-18	6-27
Maintenance:		
Operator's	6-19	6-30
Organizational	6-20	6-31
Radio Set Control AN/GSA-7 and Oscillator O-574/GRA; description and operation	6-9	6-8
Radio Set Control AN/GRA-6:		
Radio/wire integration (RWI)	6-10*b*	6-16
Remote control	6-10*a*	6-15
Radio Set Control Group AN/GRA-39(*):		
Radio-wire integration (RWI)	6-8*b*	6-6
Remote control	6-8*a*	6-6
Radio system:		
Cables used with radio system	6-4	6-2
Cabling diagrams	2-13*c*	2-27
Frequency selection	2-2*b*	2-1
Function of controls, indicators, receptacles (*see* individual components).		
Installation, removal, replacement (*see* individual component).		
Maintenance (*see* Maintenance, radio system).		
Operating procedures:		
Receiver R-442(*)/VRC	3-19	3-26
Retransmission	3-21	3-29
RT-246(*)/VRC and C-2742/VRC	3-18	3-25
RT-524(*)/VRC	3-17	3-23
Performance requirements	5-8	5-9
Power, forward and reflected measurement	5-7*b*	5-7
Siting	2-2*a*	2-1
Troubleshooting (*see* Maintenance, radio system).		
Radio/wire integration (RWI) procedures:		
AN/GRA-6	6-10*b*	6-16
AN/GRA-39(*)	6-8*b*	6-6
Receiver, Radio R-442(*)/VRC:		
Antenna system	2-9	2-9
Application of	1-7	1-3
Components	1-9*a*	1-11
Description	1-13*b*	1-16

	Paragraph or table	Page
Receiver, Radio R–442(*)/VRC—Continued		
Differences in models	1–12	1–15
Function of controls, indicators, receptacles	3–4	3–4
Installation, removal, replacement	2–6	2–4
Items required to make operational	1–11	1–14
Maintenance (see Maintenance, radio system).		
Operating instructions	3–19	3–26
Squelch mode operation	3–16	3–23
Technical characteristics	1–8	1–10
Troubleshooting:		
Operator's	4–5	4–6
Organizational	5–9	5–13
Unit	5–11*e*	5–21
Receiver-transmitters (RT–246(*)/VRC and RT–524(*)/VRC):		
Antenna systems (*see* Antennas AS–1729/VRC and AT–912/VRC).		
Application	1–7	1–3
Description	1–13*a*	1–15
Function of controls, indicators, receptacles:		
RT–246(*)/VRC	3–2	3–1
RT–524(*)/VRC	3–3	3–4
Items required to make operational	1–11	1–14
Installation, disassembling, handling	2–5	2–3
Maintenance (*see* Maintenance, radio system).		
Operating instructions	3–17	3–23
Operating RT–246(*)/VRC with C–2742/VRC	3–18	3–25
Repairs	5–13	5–24
Squelch mode operation	3–16	3–23
Technical characteristics	1–8	1–10
Troubleshooting:		
Operator	4–5	4–6
Organizational	5–9	5–13
Unit	5–11	5–18
Recognition of jamming	3–22	3–30
Remote radio control, using:		
AN/GSA–7 and O–574/GRA	6–9	6–8
AN/GRA–6	6–10*a*	6–15
AN/GRA–39(*)	6–8*a*	6–6
Repair procedures, general	5–12	5–22
Reporting of errors in manual	1–5	1–2
Retransmission Cable Kit MK–456A/GRC, use	6–7	6–3
Retransmission operation:		
AN/VRC–49, AN/VRC–45	3–21	3–29
AN/VRC–54	6–13*b*(5)	6–22
AN/VRC–55	6–18*b*(4)	6–27
Radio-intercom system	3–21*d*	3–29
Using MK–456A/GRC	6–7	6–3
Scope of manual	1–1	1–1
Service upon receipt of equipment	2–1	2–1
Shelter requirements	2–3	2–2
Siting requirements	2–2*a*	2–1
Squelch mode operations, conditions for	3–16	3–23
System application:		
AN/VRC–12 series radios	1–7	1–3
AN/VRC–54	6–11	6–18
AN/VRC–55	6–16	6–25
Cabling diagrams	2–13*c*	2–27
Systems:		
Radio-intercom system (*see* Radio-intercom system).		
Radio system (*see* Radio system).		

	Paragraph or table	Page
Technical characteristics:		
AN/VRC–12 series radios	1–8	1–10
AN/VRC–54	6–11	6–18
AN/VRC–55	6–16	6–25
Test Set, Radio Frequency TS–2609/U:		
Performance requirements use	5–8	5–9
Troubleshooting receiver-transmitters	5–9	5–13
Use with receiver-transmitters	5–7	5–7
Transmitting power measurements, forward and reflected power	5–7	5–7
Tuning procedures:		
Receiver R–442(*)/VRC	3–19	3–26
Receiver-transmitters	3–17	3–23
Troubleshooting equipment (*see* Maintenance, troubleshooting of required units).		
Using lubricants	5–3	5–5
Using TS–2609/U for RF power measurements	5–7	5–7
Vehicular installations	2–13	2–22
X-mode:		
Connections, switch position:		
Receiver R–442(*)/VRC	2–6*c*	2–4
Receiver-transmitter	2–5*d*	2–4
Operation, general	3–14*e*	3–16
X-MODE-NORMAL switch positioning	5–13*b*	5–33

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Distribution:

To be distributed in accordance with DA Form 12-51, Operator Maintenance requirements for AN/VRC-12, AN/VRC-43, AN/VRC-44, AN/VRC-45, AN/VRC-46, AN/VRC-47, AN/VRC-48, AN/VRC-49, AN/VRC-54, and AN/VRC-55.

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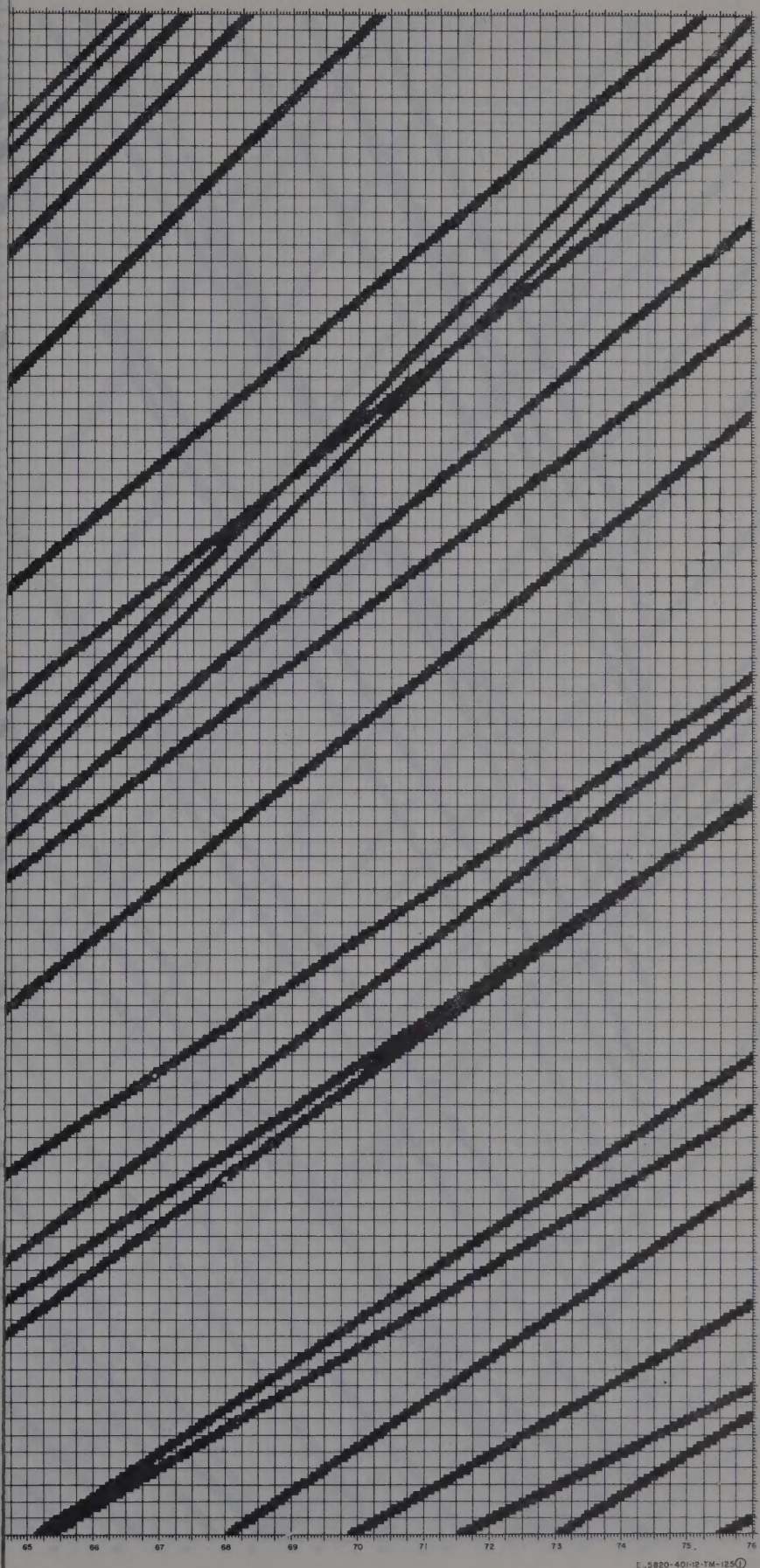

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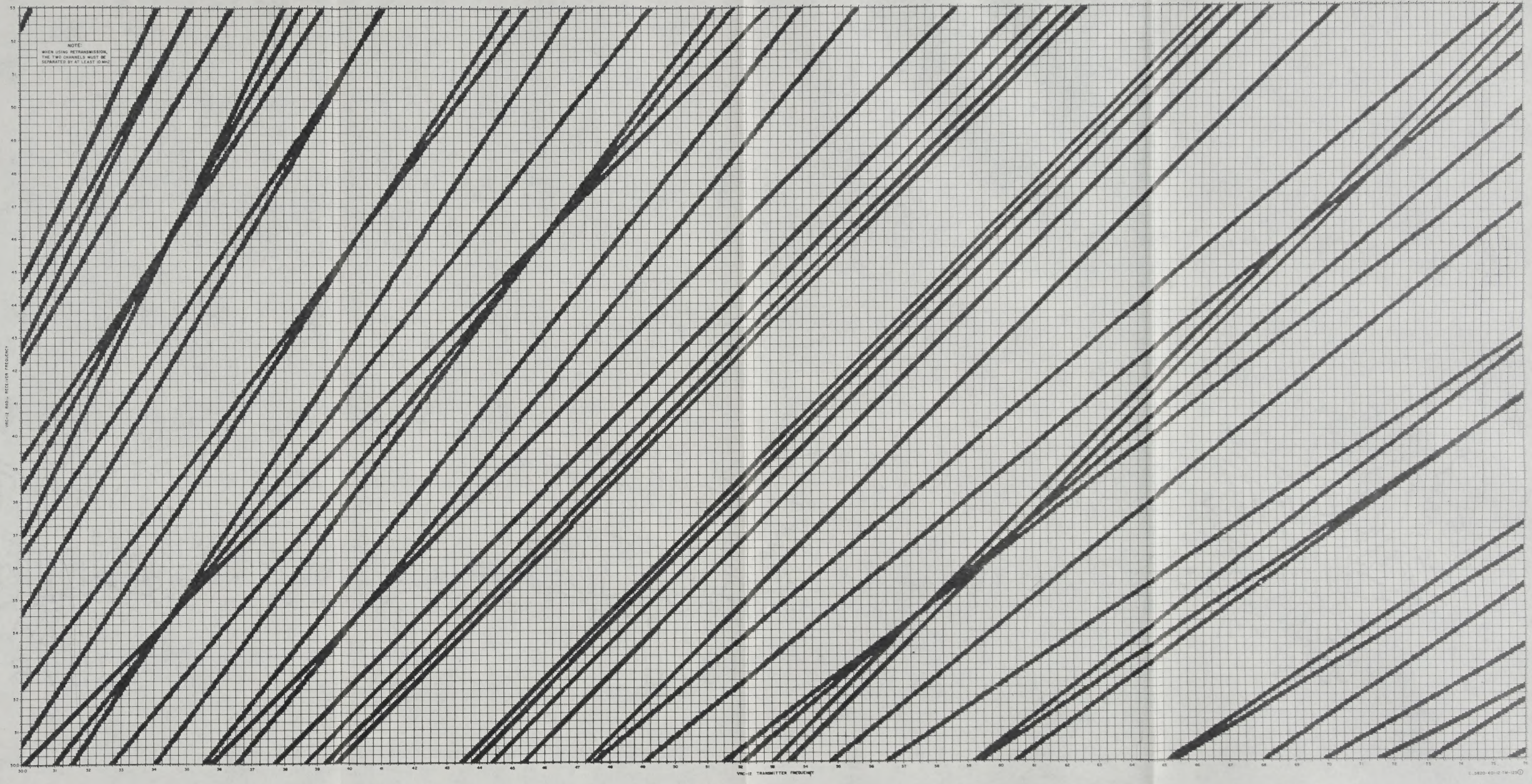

NOTE:
WHEN USING RETRANSMISSION, THE TWO CHANNELS MUST BE SEPARATED BY AT LEAST 10 MHz
VHF-12 RADIO RECEIVER FREQUENCY
VHF-12 TRANSMITTER FREQUENCY

Figure FO–1①. Interfering frequencies chart.

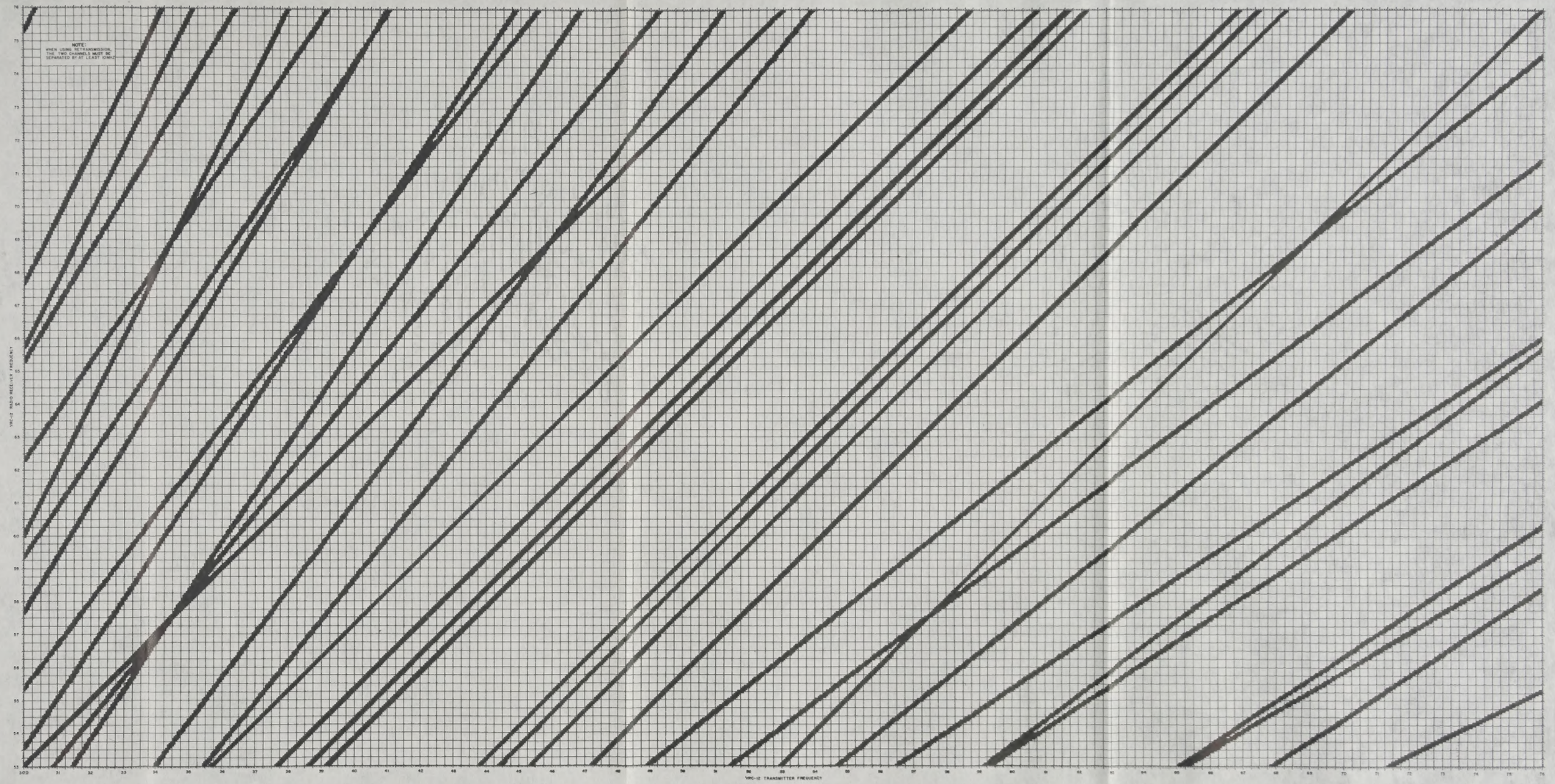

NOTE:
WHEN USING SIMULTANEOUS TRANSMISSION, THE TWO CHANNELS MUST BE SEPARATED BY AT LEAST 10MHZ
VRC-12 RECEIVER FREQUENCY
VRC-12 TRANSMITTER FREQUENCY

Figure FO–1⑥. Interfering frequencies chart.

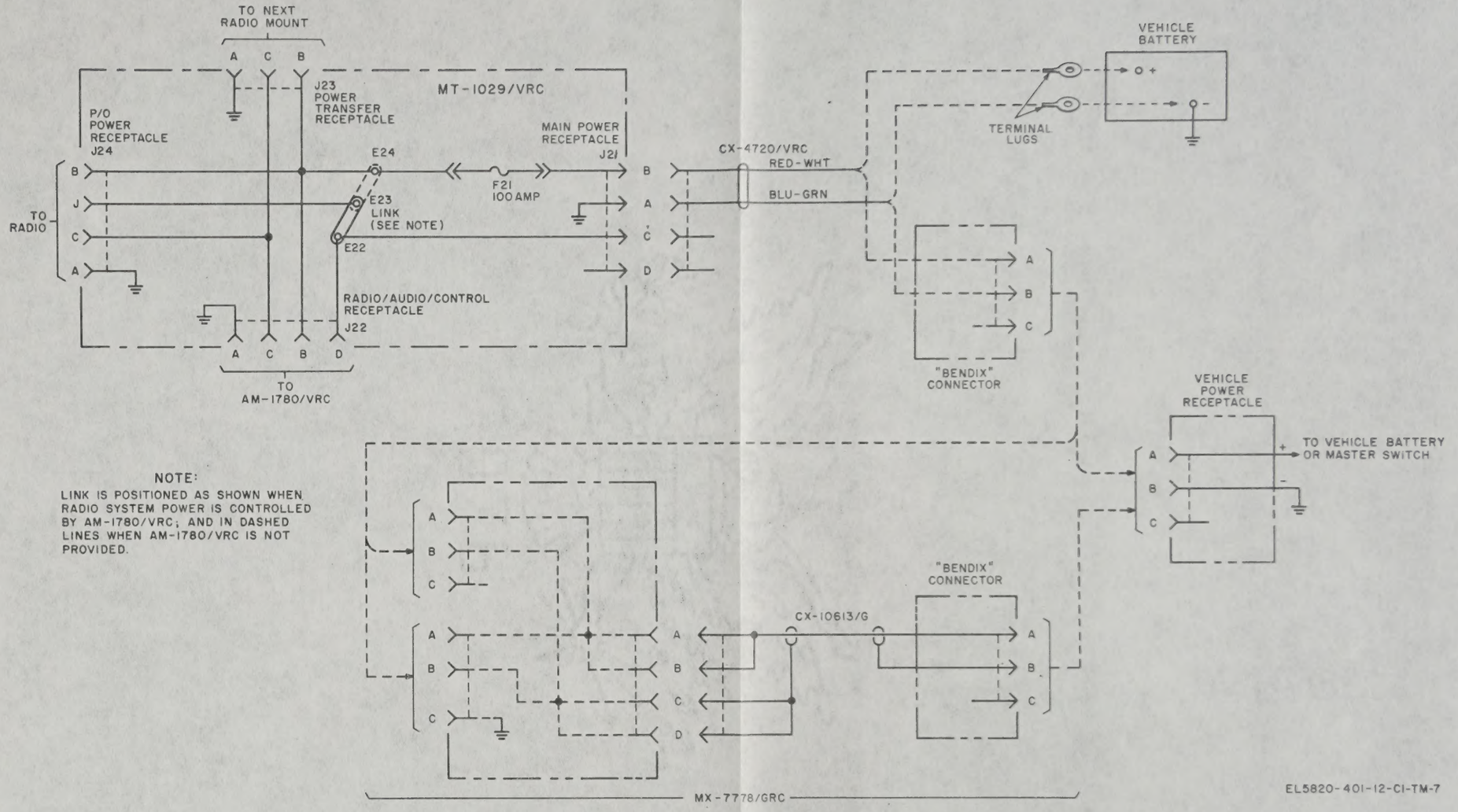
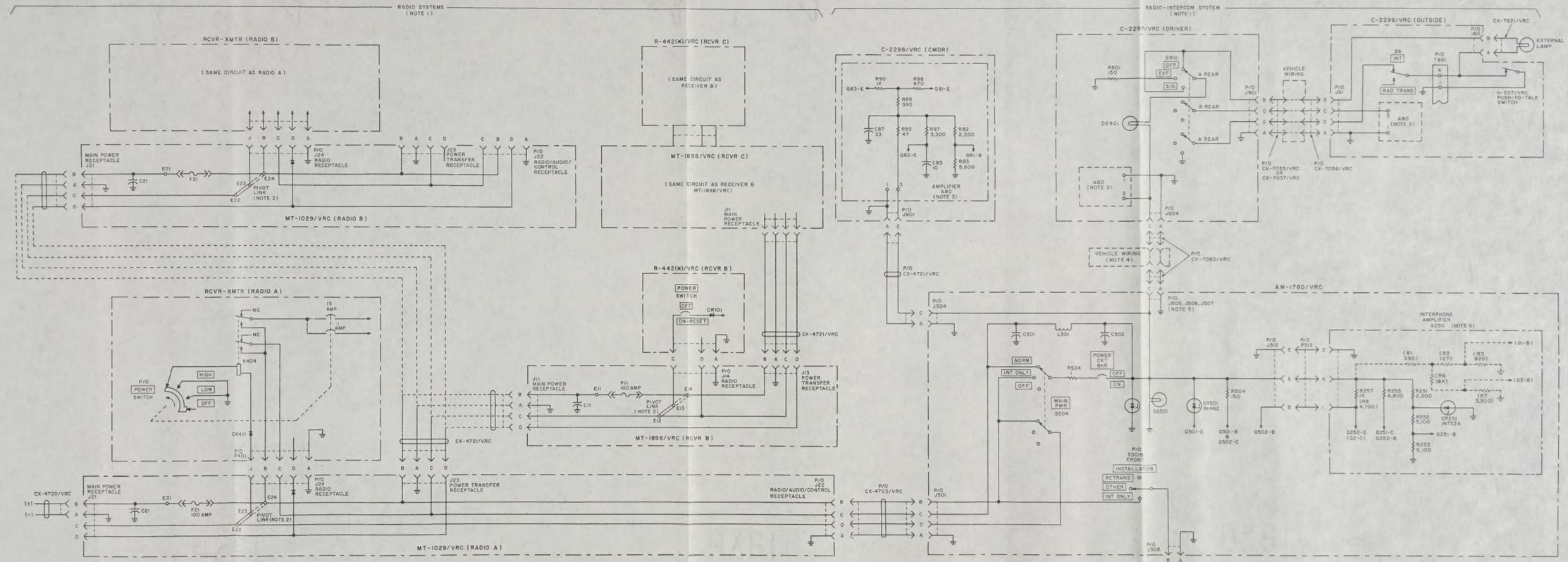


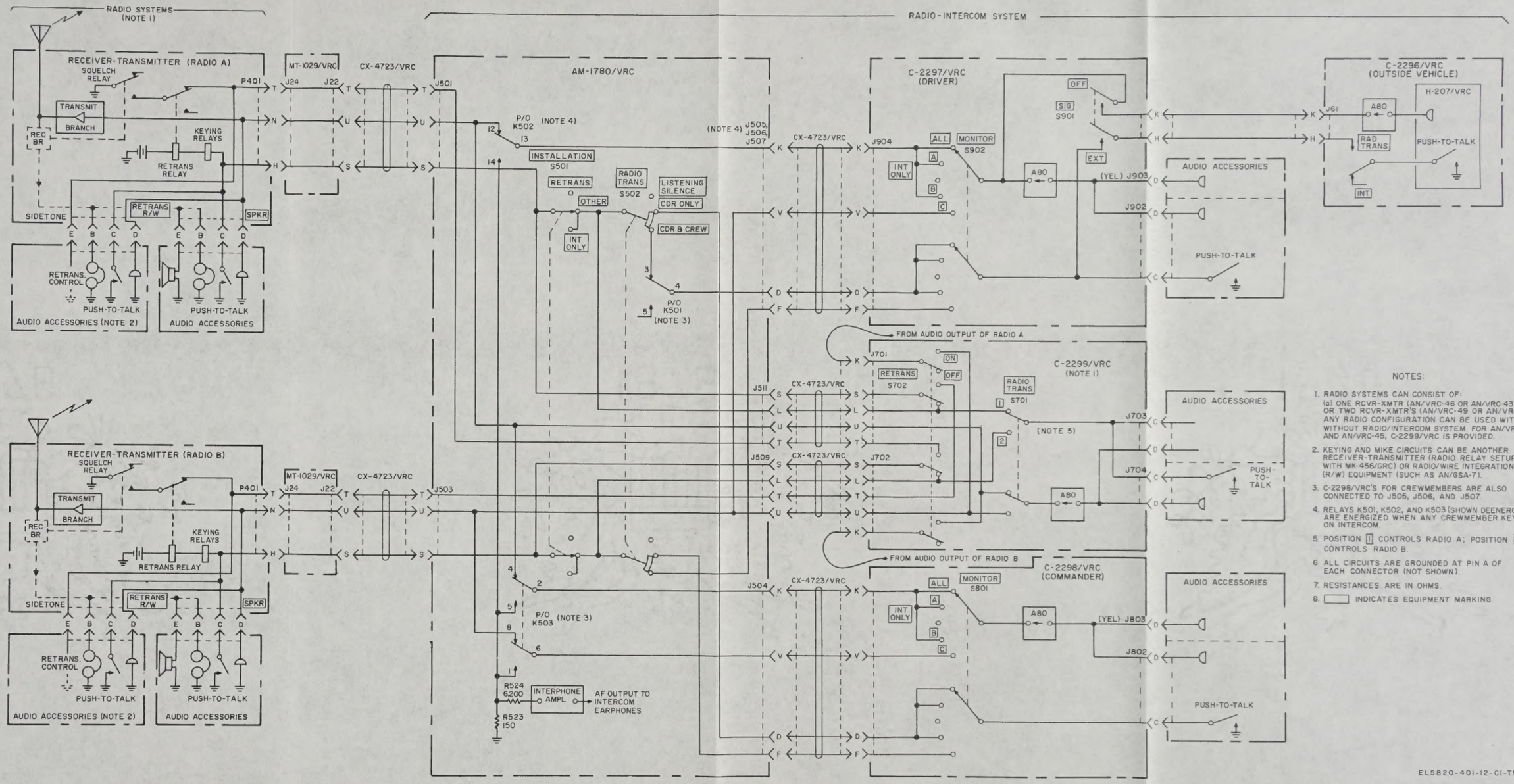
Figure FO-2. Dc power distribution circuits of MT-1029/VRC, CX-4720/VRC, and MX-7778/GRC.



NOTES:

1. RADIO SYSTEM CAN CONSIST OF
   (A) ONE RCVR-XMTR;
   (B) TWO RCVR-XMTRS;
   (C) ONE RCVR-XMTR WITH R-442(*)/VRC; OR
   (D) ONE RCVR-XMTR WITH TWO R-442(*)/VRC'S
   ANY RADIO CONFIGURATION CAN BE USED WITH OR WITHOUT RADIO-INTERCOM SYSTEM. (SEE NOTE 2.)
2. WITH LINK IN POSITION SHOWN, POWER FOR BOTH RADIO(S) AND RADIO-INTERCOM SYSTEM IS CONTROLLED BY MAIN PWR SWITCH IN AM-1780/VRC. WHEN RADIO-INTERCOM SYSTEM IS NOT USED WITH THE RADIO SYSTEM, THE LINK MUST BE POSITIONED AS SHOWN IN DASHED LINES.
3. ASSEMBLY A80, SHOWN IN C-2298/VRC, C-2297/VRC, AND C-2296/VRC, IS IDENTICAL. CIRCUIT DETAILS ARE SHOWN ONLY IN C-2298/VRC.
4. CX-4723/VRC IS USED INSTEAD OF VEHICLE WIRING AND CX-7060/VRC'S IN SOME VEHICLE INSTALLATIONS.
5. C-2298/VRC'S FOR CREWMEMBERS ARE ALSO CONNECTED TO J505, J506, AND J507.
6. PARTS IN PARENTHESES ARE USED IN HIGH GAIN VERSION OF A250.
7. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
8. ▭ INDICATES EQUIPMENT MARKING.

Figure FO-3. Dc power distribution circuits of radio system and radio-intercom system.



NOTES:

1. RADIO SYSTEMS CAN CONSIST OF: (a) ONE RCVR-XMTR (AN/VRC-46 OR AN/VRC-43); OR TWO RCVR-XMTR'S (AN/VRC-49 OR AN/VRC-45). ANY RADIO CONFIGURATION CAN BE USED WITH OR WITHOUT RADIO/INTERCOM SYSTEM. FOR AN/VRC-49 AND AN/VRC-45, C-2299/VRC IS PROVIDED.
2. KEYING AND MIKE CIRCUITS CAN BE ANOTHER RECEIVER-TRANSMITTER (RADIO RELAY SETUP WITH MK-456/GRC) OR RADIO/WIRE INTEGRATION (R/W) EQUIPMENT (SUCH AS AN/GSA-7).
3. C-2298/VRC'S FOR CREWMEMBERS ARE ALSO CONNECTED TO J505, J506, AND J507.
4. RELAYS K501, K502, AND K503 (SHOWN DEENERGIZED) ARE ENERGIZED WHEN ANY CREWMEMBER KEYS ON INTERCOM.
5. POSITION [1] CONTROLS RADIO A; POSITION [2] CONTROLS RADIO B.
6. ALL CIRCUITS ARE GROUNDED AT PIN A OF EACH CONNECTOR (NOT SHOWN).
7. RESISTANCES ARE IN OHMS.
8. [ ] INDICATES EQUIPMENT MARKING.

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Figure FO-4. Radio Transmission circuits of audio signals (microphone) and keying control in radio system and radio-intercom system.

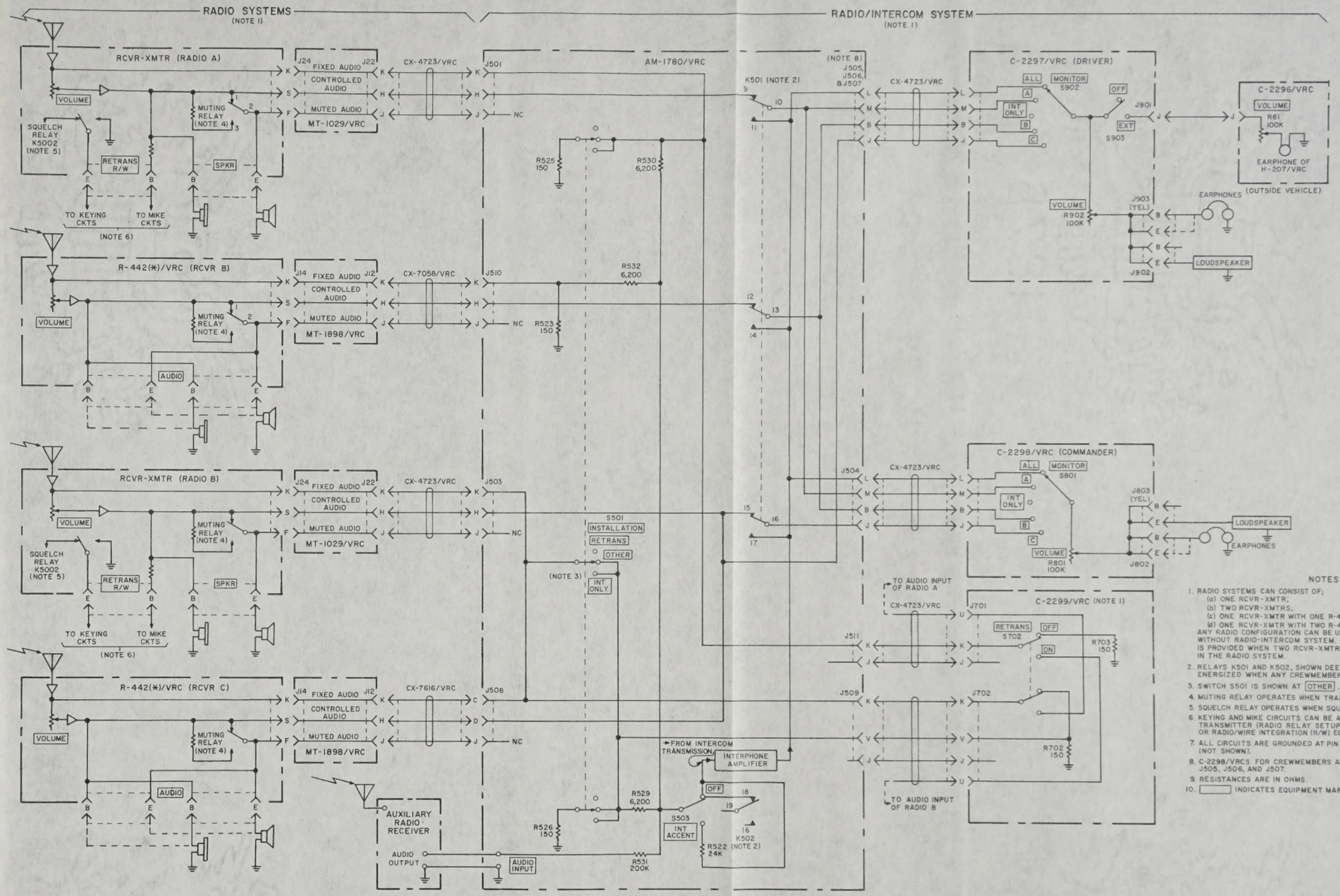


Figure FO-5. Radio reception circuits of audio signals in radio system and radio-intercom system.

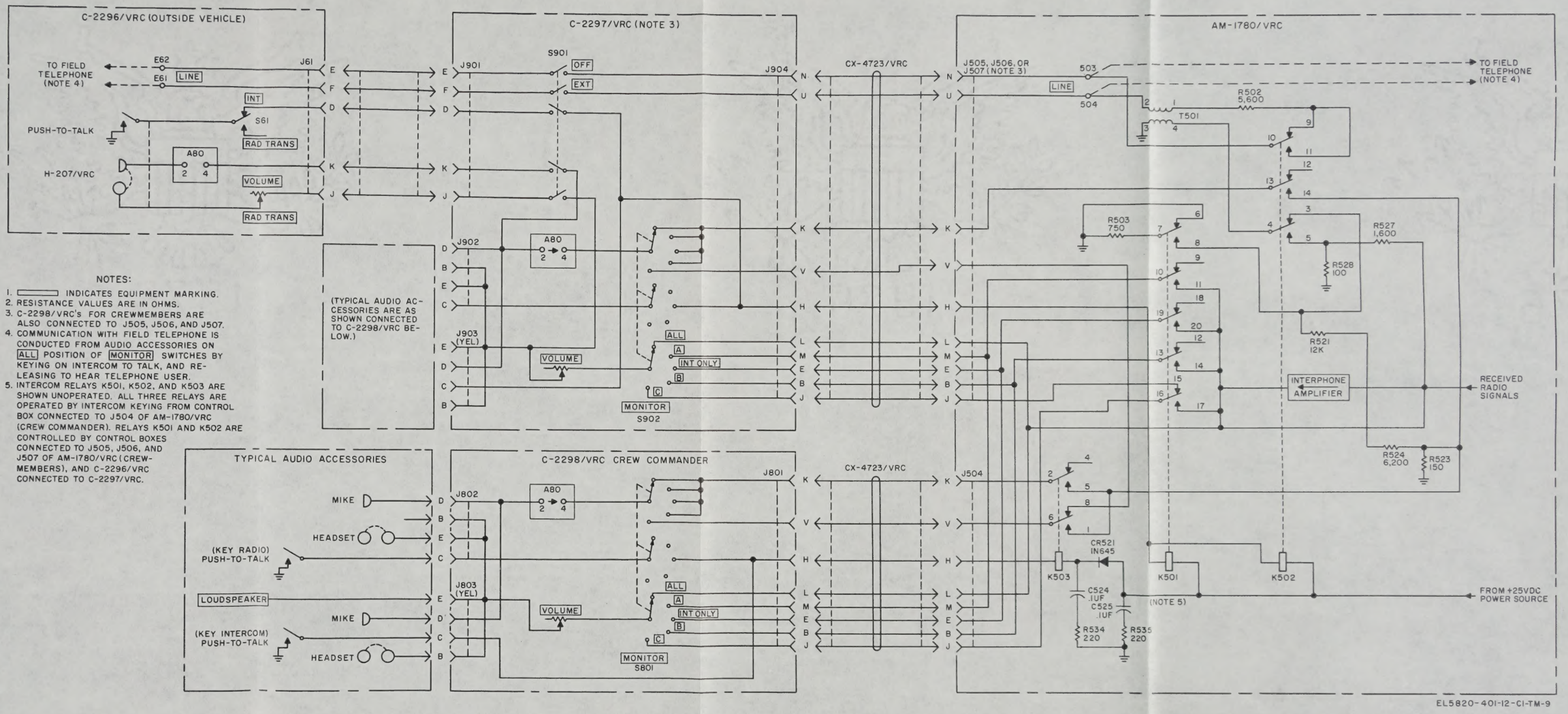
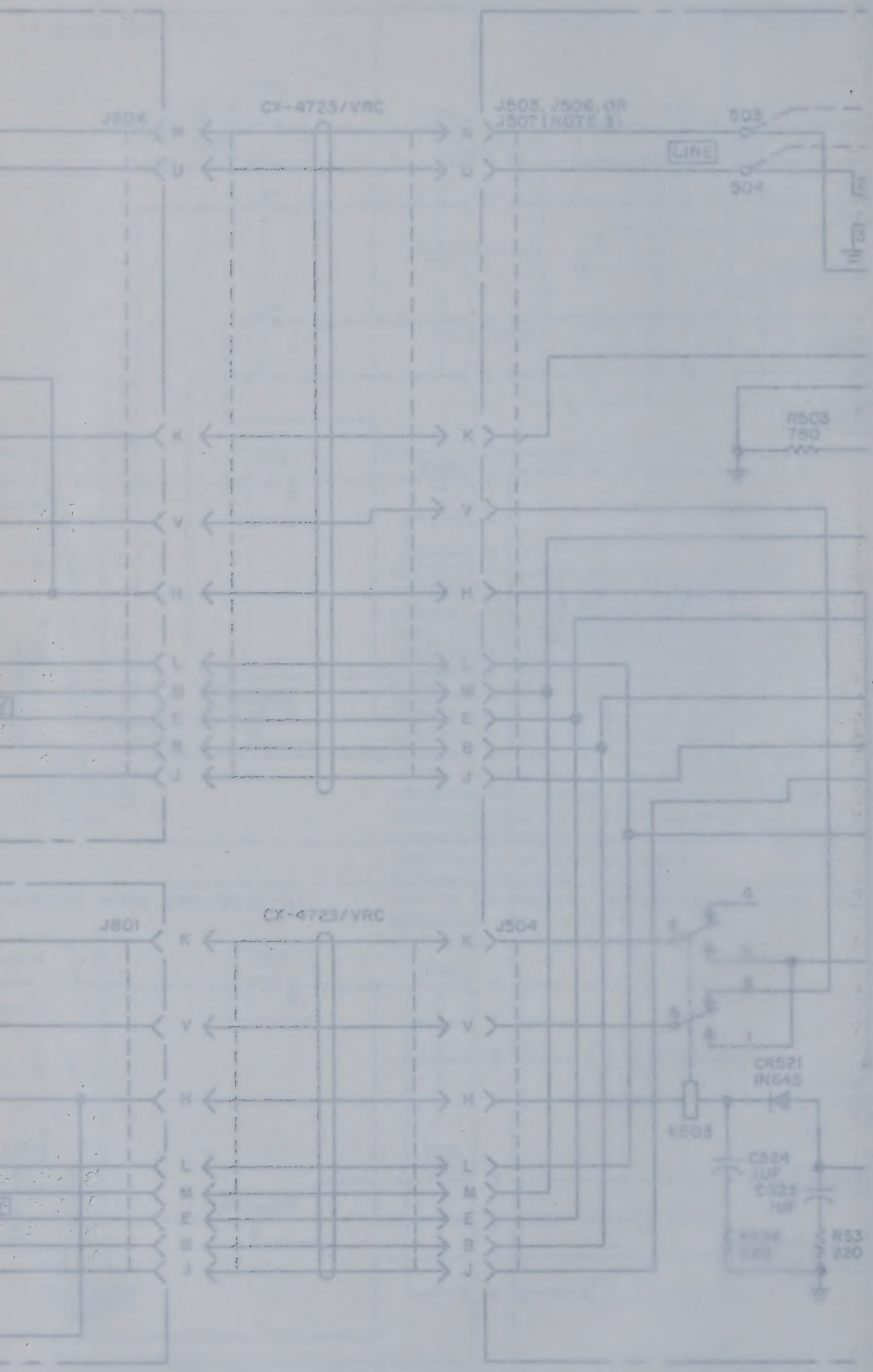


Figure FO-6. Intercom transmission and reception circuits of audio signals and keying control in radio-intercom system.



transmission and reception circuits of audio signals control in radio-intercom system.